CLASS – 6

PLANNER AND ASSIGNMENT

FROM: 1FEBRUARY TO 6 FEBRUARY

TOPIC: DATA HANDLING

SUBTOPIC:

- **FREQUENCY DISTRIBUTION TABLE**
- **PICTOGRAPH**
- **BAR GRAPH**

NUMBER OF BLOCKS: 6

GUIDELINES: REFER TO THE CONTENT GIVEN BELOW AND VIEW THE LINKS

- **THE NOTES GIVEN BELOW WILL HELP YOU TO UNDERSTAND THE CONCEPT AND COMPLETE THE ASSIGNMENT THAT FOLLOWS**
- **THE ASSIGNMENT IS TO BE DONE IN MATH NOTE BOOK**

INSTRUCTIONAL AIDS/RESOURCE

CHAPTER WILL BE EXPLAINED THROUGH POWER POINT PRESENTATION AND VIDEOS THROUGH ZOOM CLASSES,

Click on the links below to understand the concepts more

- https://youtu.be/CAFIgO4_jNw
- https://youtu.be/6ntAlOUrdCc
- https://youtu.be/Lk1t1ejdJvY
- https://youtu.be/ci4S6F40f5k

LEARNING OBJECTIVES

At the end of the lesson, each child will be able to:

- **Define data, frequency.**
- **To organize data and prepare frequency distribution table.**
- **To Draw & interpret pictograph and Bar graph.**

DEVELOPMENT OF LESSON

Data and information

- **Data is a collection of numbers gathered to give some information.**

Frequency

- **Frequency is the number of times a particular value occurs in a given data.**
- **Eg : Marks scored by different students in a class: 1, 2, 2, 4, 3, 3.**

Marks	Frequency
1	1
2	2
3	2
4	1

Organised Data

- **Data should be organised properly.**
- **This helps in extracting information.**
- **Example: In a class, 20 students were asked to choose one fruit from Banana, Orange, Apple and Guava.**
  The following shows organised data for the above information is given below.

Fruits	No. of Students

Banana	8
Orange	3
Apple	5
Guava	4

Prioritizing Data

- Data can be prioritized or it can be organised in a particular order according to importance.
- Example: Following are the names of students in a class: Anu, Shameer, Kiran, John. Prioritize the data according to alphabetic order. On prioritising the data, the new order of names become Anu, John, Kiran and Shammer.

How to organise data?

- Data can be organised in different ways. It can be organised in
  (i) Alphabetical order
  (ii) In ascending and descending order.
- Example: Arrange the following data according to the birth year.

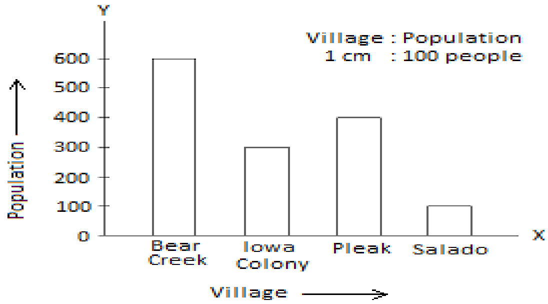
Ravi	Shekhar	Sunny	Asha
1970	1988	1979	1920

Organised data:

Asha	Ravi	Sunny	Shekhar
1920	1970	1979	1988

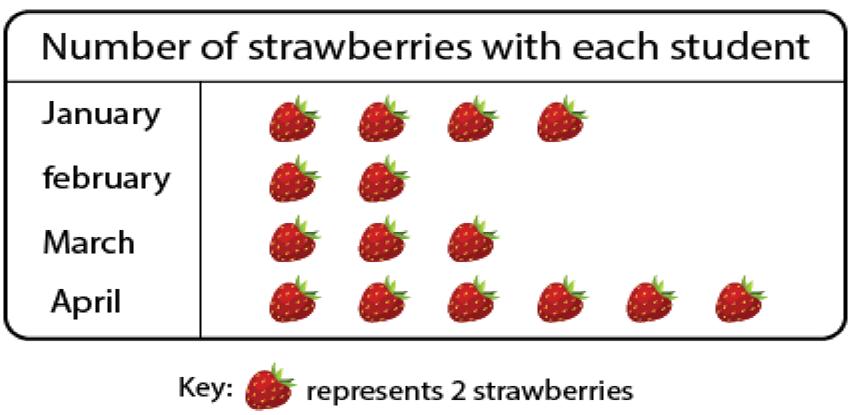
Scaling Factor

- **The large numbers cannot be represented in a bar graph, so the scaling factor is used to reduce or scale down large numbers.**



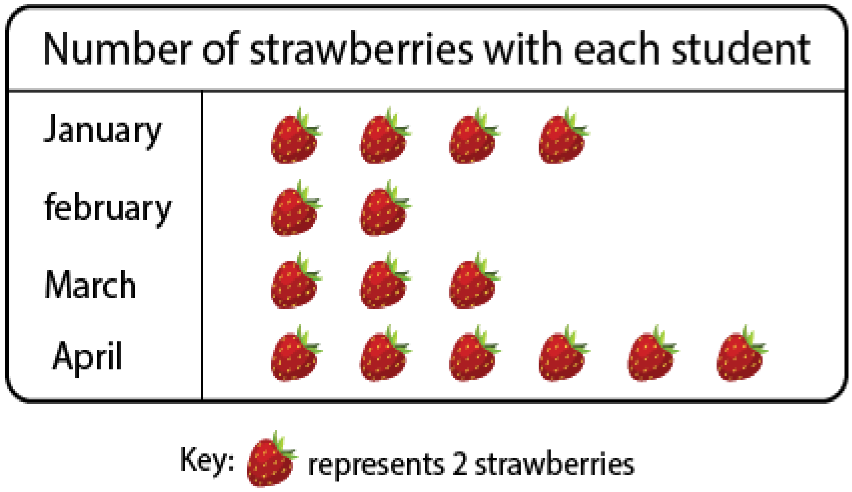
Pictographs

- **The pictograph is a pictorial representation of data.**
- **Here data is represented using images of the objects.**



Interpretation of pictographs

The number of strawberries eaten by various people is shown below.

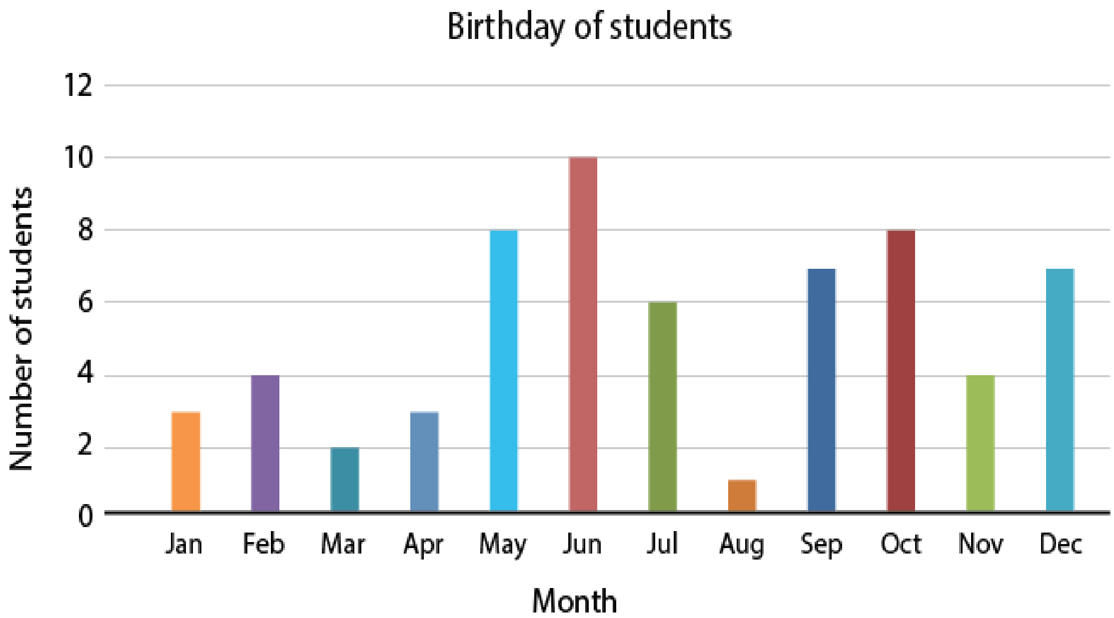


Question. Find the number of apples eaten by Margaret, Susan, Maria and Dorothy.
Solution: Here each symbol of strawberry represents two strawberries.

⇒ Margaret ate 8 strawberries, Susan ate 4 strawberries, Maria ate 2 strawberries and Dorothy ate 12 strawberries.
So, the total number of strawberries eaten by all the four is 30

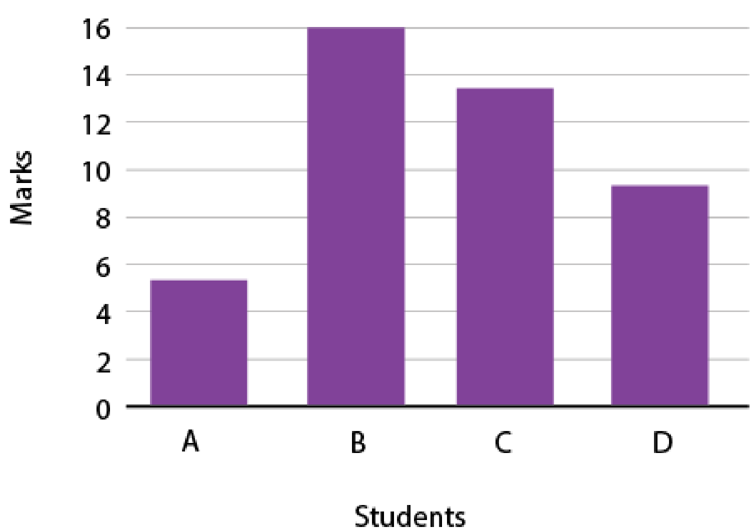
Bar diagrams

- **The graphical representation of data using bars of uniform width drawn vertically or horizontally with different lengths is called as bar graphs/bar diagrams.**
- **Bar diagrams consist of two axes: X-axis and Y-axis.**
- **The following is a bar graph showing the birthday of students in a class.**



Interpretation of bar diagrams

- **Given below are the marks scored by students in mathematics. Calculate the sum of marks scored by A and C.**



Solution:

Students	**Marks Obtained**

A	8
B	14
C	9
D	5

Sum of marks scored by A and C = 8 + 9 = 17
∴ The required sum is 17.

Collection of numbers gathered together to give some valuable information is called data. Pictograph shows numerical information by making use of icons or picture symbols to represent data sets. Pictograph can also be defined as a visual presentation of data using symbols, pictures, icons, etc.

What is the Bar graph?

A bar graph is also called a bar chart. It is used to represent data visually with the help of bars which are of different heights or lengths. The date graphed is either horizontally or vertically, to make it easy for the viewers to compare different values and therefore draw conclusions quickly.

Solved examples:

1. The following table shows the daily production of T.V. sets in an industry for 7 days of a week:

Days	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
Number of TV Sets	300	400	150	250	100	350	200

Represent the above information by a pictograph.

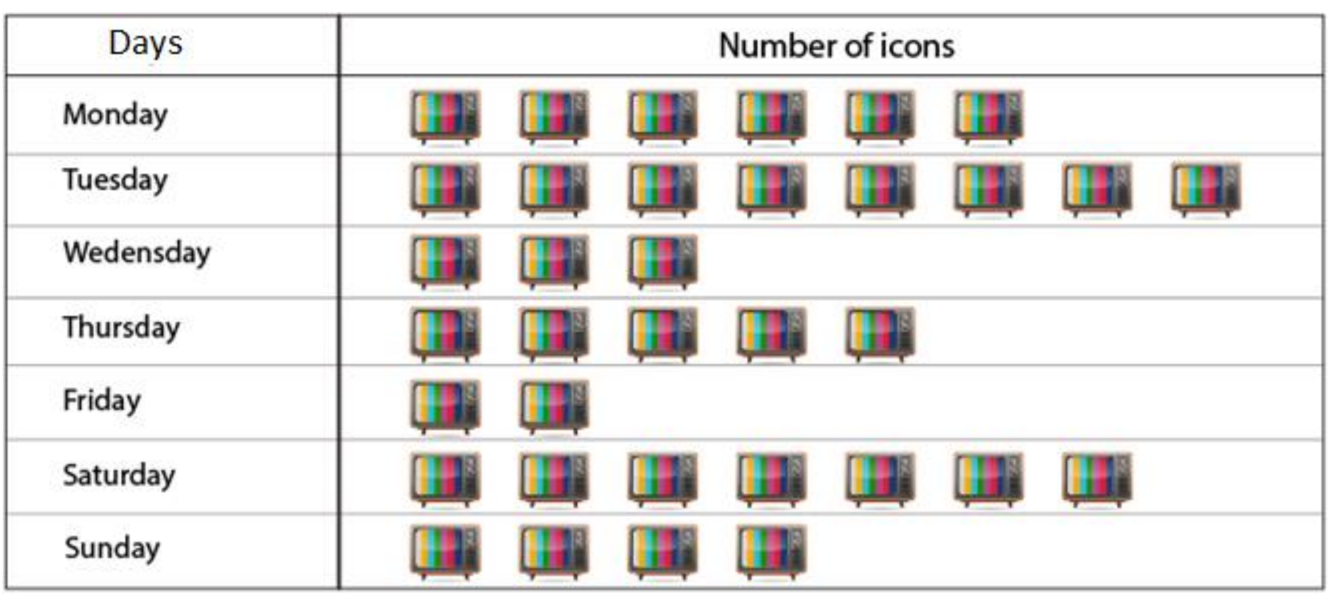
Solution:

Consider that a TV icon represents 50 TVs.

So the number of icons produced by the industry on various days of a week are given below:

Days	Number of icons
Mon	300/50 = 6
Tue	400/50 = 8
Wed	150/50 = 3
Thurs	250/50 = 5
Fri	100/50 = 2
Sat	350/50 = 7
Sun	200/50 = 4

Below given is the pictograph which represents the above data:



2. The following table shows the number of Maruti cars sold by five dealers in a particular month:

Dealer	Saya	Bagga Links	D.D. Motors	Bhasin Motor	Competent Motors
Cars sold	60	40	20	15	10

Represent the above information by a pictograph.

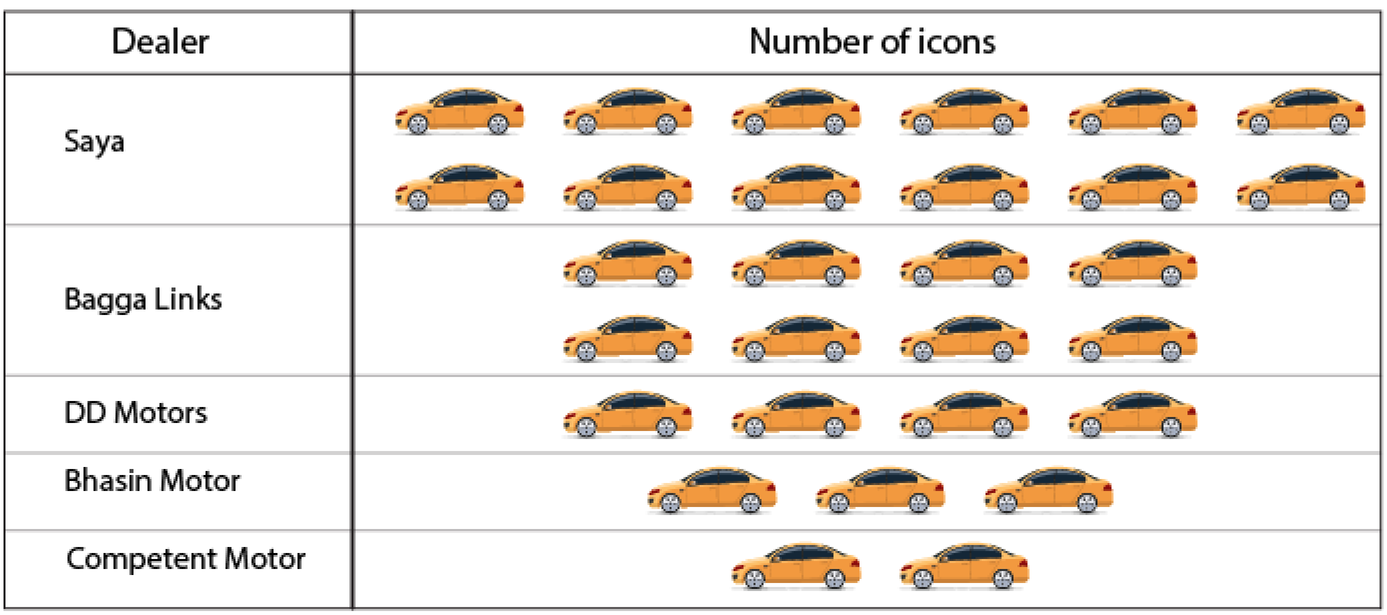
Solution:

Consider that one car icon represents 5 Maruti cars.

So the number of icons sold by the 5 dealers in a particular month are as given below:

Dealer	Number of icons
Saya	60/5 = 12
Bagga Links	40/5 = 8
DD Motors	20/5 = 4
Bhasin Motor	15/5 = 3
Competent Motor	10/5 = 2

Below given is the pictograph which represents the above data:



3. The population of Delhi State in different census years is as given below:

Census year	1961	1971	1981	1991	2001
Population in Lakhs	30	55	70	110	150

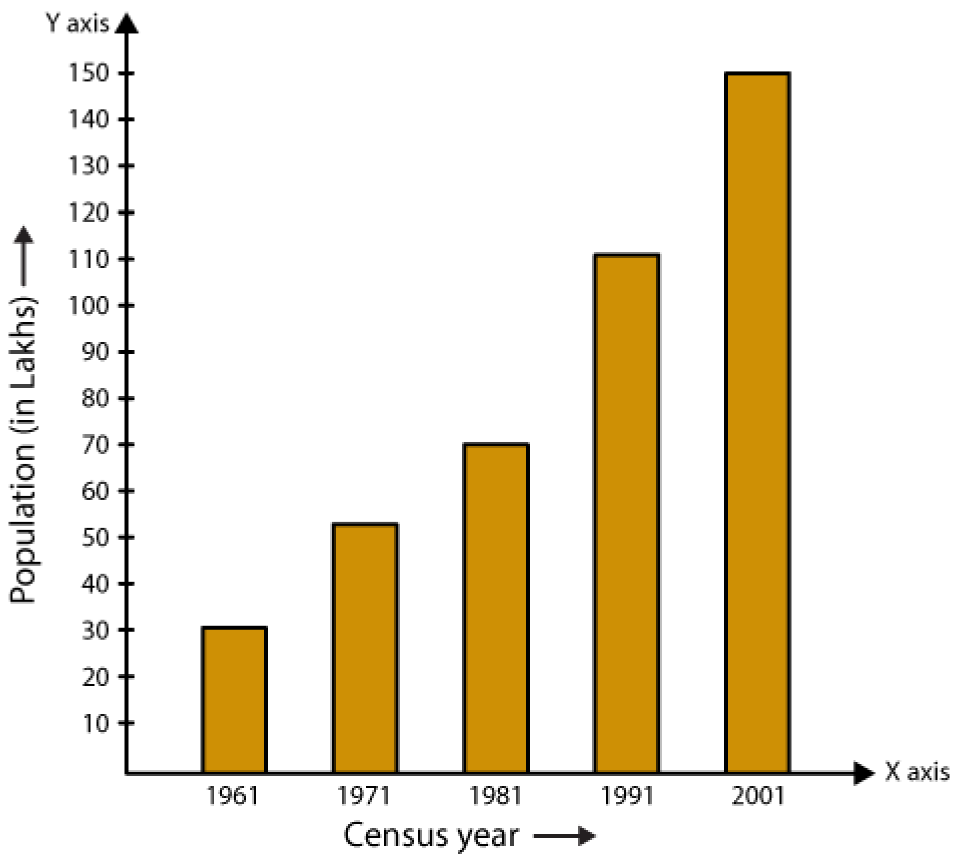
Represent the above information with the help of a bar graph.

Solution:

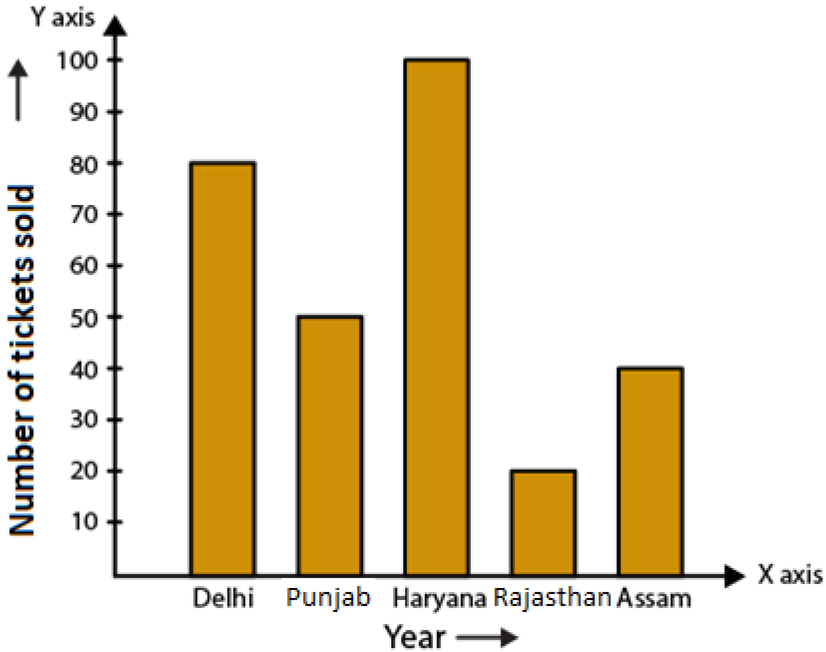
In order to represent the data on a bar graph, we should construct a horizontal and a vertical line. We know that the horizontal line represents the census year and the vertical line represents the population in lakhs.

Here 5 values are given so mark 5 points on the horizontal axis having equal distances and erect rectangles having same width and heights proportional to the given data.

The same way, on vertical axis, difference between two points is 10 which represents a population of 10 lakhs.



4. Read the bar graph show in Fig. 23.8 and answer the following questions:



(i) What is the information given by the bar graph?

(ii) How many tickets of Assam State Lottery were sold by the agent?

(iii) Of which state, were the maximum number of tickets sold?

(iv) State whether true or false.

The maximum number of tickets sold is three times the minimum number of tickets sold.

(v) Of which state were the minimum number of tickets sold?

Solution:

(i) The bar graph represents the number of tickets of different state lotteries sold by an agent on a day.

(ii) 40 tickets of Assam State Lottery were sold by the agent.

(iii) The maximum number of tickets were sold in the state Haryana.

(iv) False.

We know that

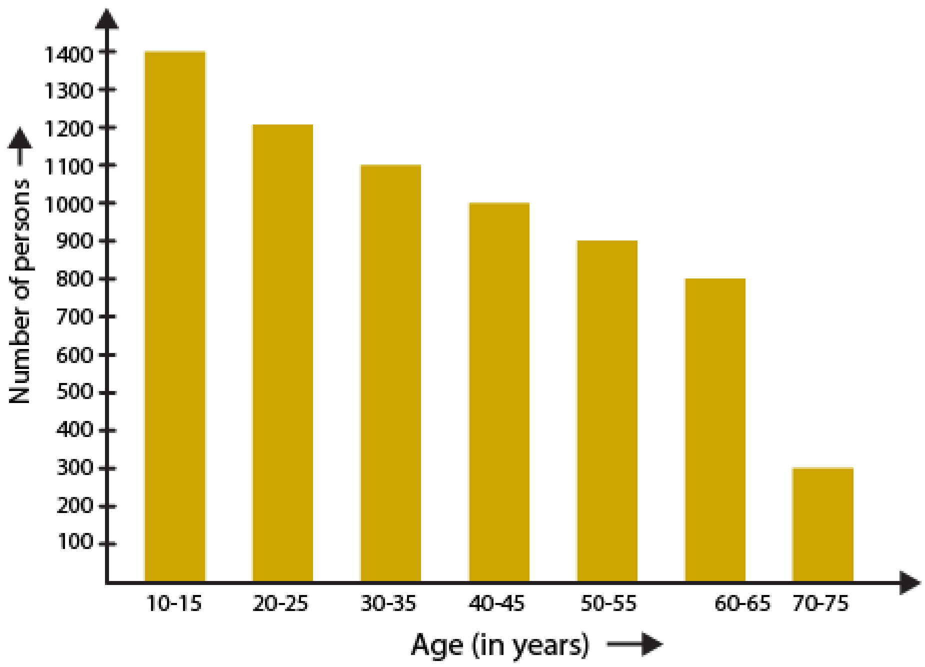
Maximum vertical length = 100 units (Haryana)

Minimum vertical length = 20 units (Rajasthan)

So the maximum number of lottery sold for one state is 100 tickets and the minimum is 20 tickets.

(v) The minimum number of tickets were sold of Rajasthan state.

5. Study the bar graph representing the number of persons in various age groups in a town shown in Fig. 23.9. Observe the bar graph and answer the following questions:



(i) What is the percentage of the youngest age-group persons over those in the oldest age group?

(ii) What is the total population of the town?

(iii) What is the number of persons in the age-group 60 – 65?

(iv) How many persons are more in the age-group 10-15 than in the age group 30-35?

(v) What is the age-group of exactly 1200 persons living in the town?

(vi) What is the total number of persons living in the town in the age-group 50-55?

(vii) What is the total number of persons living in the town in the age-groups 10-15 and 60-65?

(viii) Whether the population in general increases, decreases or remains constant with the increase in the age-group.

Solution:

(i) We know that the youngest age is 10-15 years.

No. of persons in the youngest age group = 1400

70-75 years is the oldest age group.

No. of persons in the oldest age group = 300

So the difference = 1400 – 300 = 1100

Hence, the youngest group has 1100 more people than the oldest group.

Percentage of the youngest group over oldest group = (1100/300) × 100 = 1100/3 = 366 2/3 %

(ii) We know that the total population of the town = total number of people from all age groups

By substituting the values

Total population of the town = 1400 + 1200 + 1100 + 1000 + 900 + 800 + 300 = 6700

(iii) From the bar graph we come to know that the age group 60-65 years consists of 800 persons.

(iv) No. of persons in the age group 10-15 = 1400

No. of persons in the age group 30-35 = 1100

So the number of more persons in the age group 10-15 when compared to that of 30-35 = 1400 – 1100 = 300

(v) From the bar graph we come to know that 1200 people are living in the age group 20-25 years.

(vi) No. of persons living in the age group 50-55 is 900.

(vii) We know that 1400 persons exist in the age group 10-15 years and 800 persons exist in the age group 60-65 years.

So the total number of persons in the age group 10-15 years and 60-65 years = 1400 + 800 = 2200

(viii) We know that the population decreases with the increase in the age group.

6. Read the bar graph shown in Fig. 23.10 and answer the following questions:

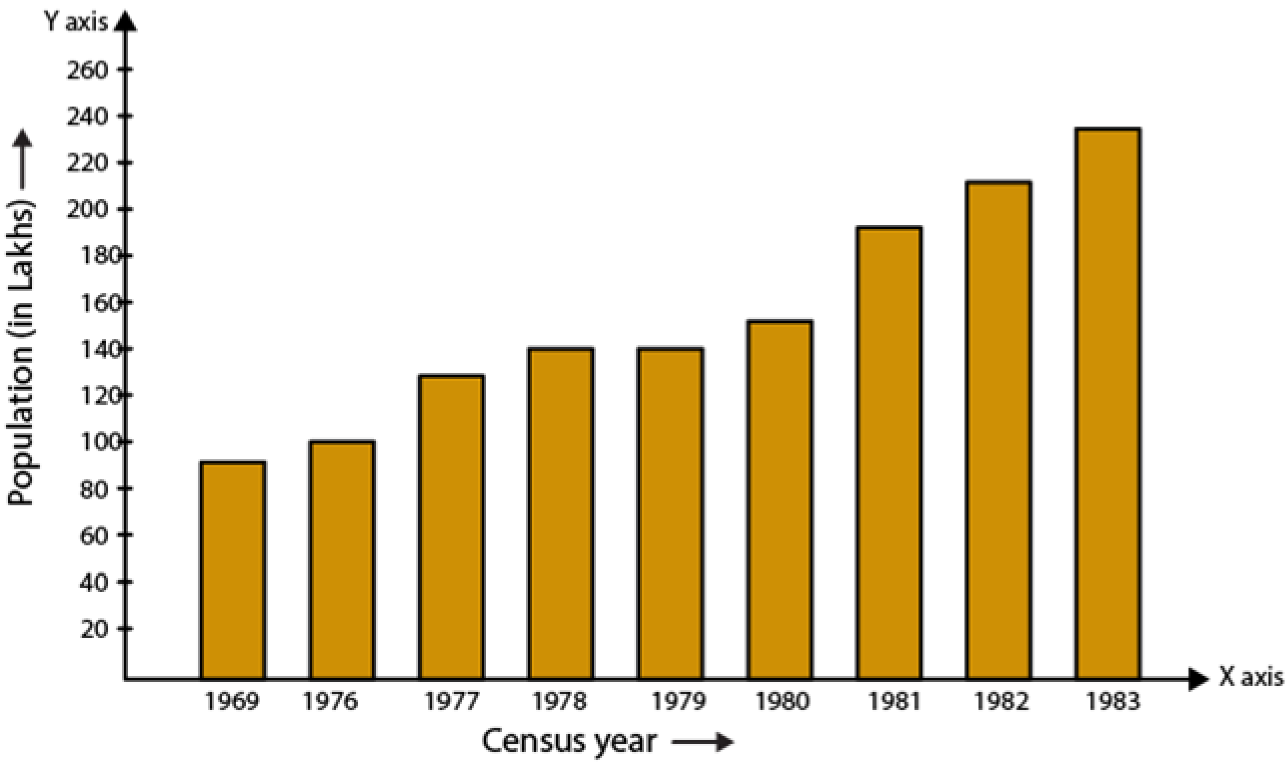
(i) What is the information given by the bar graph?

(ii) What was the number of commercial banks in 1977?

(iii) What is the ratio of the number of commercial banks in 1969 to that in 1980?

(iv) State whether true or false:

The number of commercial banks in 1983 is less than double the number of commercial banks in 1969.



Solution:

(i) The bar graph represents the number of commercial banks in India during some years.

(ii) The number of commercial banks in 1977 was 130.

(iii) No. of commercial banks in 1969 = 90

No. of commercial banks in 1980 = 150

Hence, the ratio of the number of commercial banks in 1969 to that in 1980 = 90/150 = 3/5 = 3: 5.

(iv) False.

We know that

No. of commercial banks in 1983 = 230

No. of commercial banks in 1969 = 90

So we get 2 × 90 = 180

Here, 230 is greater than 180 which means the number of commercial banks in 1983 is not less than double the number of commercial banks in 1969.

7. The following table shows the interest paid by a company (in lakhs):

Year	1995-96	1996-97	1997-98	1998-99	1999-2000
Interest (in lakhs of rupees)	20	25	15	18	30

Draw the bar graph to represent the above information.

Solution:

Construct two mutually perpendicular lines OX and OY.

Let us mark years along the horizontal line OX and mark amount of interest paid by the company along the vertical line OY.

Take equal width for each bar on the axis OX.

Now let us take a suitable scale to find the heights of the bar.

Take 1 big division = 5 lakhs of rupees paid as interest by the company

So the heights of the bars are as given below:

1995-96 = 20/5 = 4 units

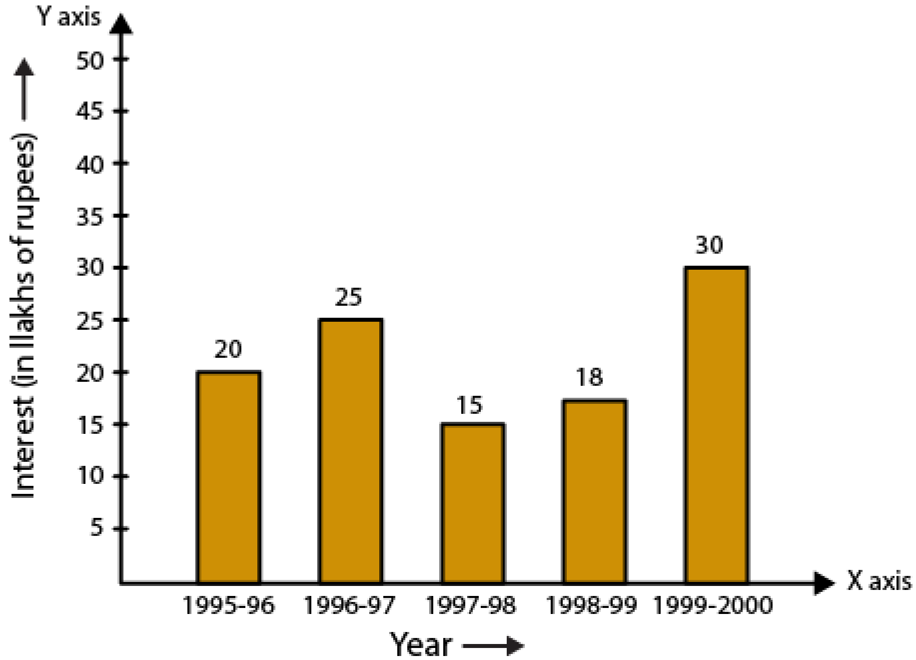
1996-97 = 25/5 = 5 units

1997-98 = 15/5 = 3 units

1998-99 = 18/5 = 3.6 units

1999-2000 = 30/5 = 6 units

Using the above calculation, the graph is as given below:



8. A die was thrown 35 times and the following numbers were obtained:
5, 1, 4, 2, 3, 2, 6, 6, 1, 4, 2, 5, 4, 5, 3, 6, 1, 5
2, 6, 2, 5, 4, 1, 3, 2, 1, 4, 1, 6, 2, 6, 3, 3, 3
Prepare a frequency table for the data.
Solution:
From the given data, we have the following table.

Number	Tally marks	Frequency
1	~~||||~~ |	6
2	~~||||~~ ||	7
3	~~||||~~ |	6
4	~~||||~~	5
5	~~||||~~	5
6	~~||||~~ |	6

.
The result of a Mathematics test is as follows:
80, 90, 70, 80, 80, 60, 80, 70, 90, 65, 100, 60, 70, 60, 70, 85, 65, 70, 70, 85, 90, 60, 65, 80, 60

9. Make a frequency table for the above data and answer the following questions:
(a) What is the maximum marks obtained?
(b) How many students score less than 75 marks?
(c) How many students scored 80 marks or above?
(d) How many students appeared in the test?
Solution:
From the above information, we have the following table.

Marks obtained	Tally marks	Frequency
60	~~IIII~~	5
65	III	3
70	~~IIII~~ I	6
80	IIII	5
85	II	2
90	III	3
100	I	1

(a) Maximum marks obtained by a student = 100
(b) 5 + 3 + 6 = 14 students obtained marks less than 75.
(c) 5 + 2 + 3 + 1 = 11 students scored marks 80 or above 80.
(d) Total 25 students were appeared in the test.

SUMMERY

Main points :

- **A data is a collection of numerical figures gathered initially to give some information.**
- **Data obtained in its original form is called data.**
- **Each numerical figure in the given data is called the frequency of the observation.**
- **Representation od data through pictures is called pictograph.**
- **Representation of data with the help of bars or rectangle is called a bar graph.**

Assignment

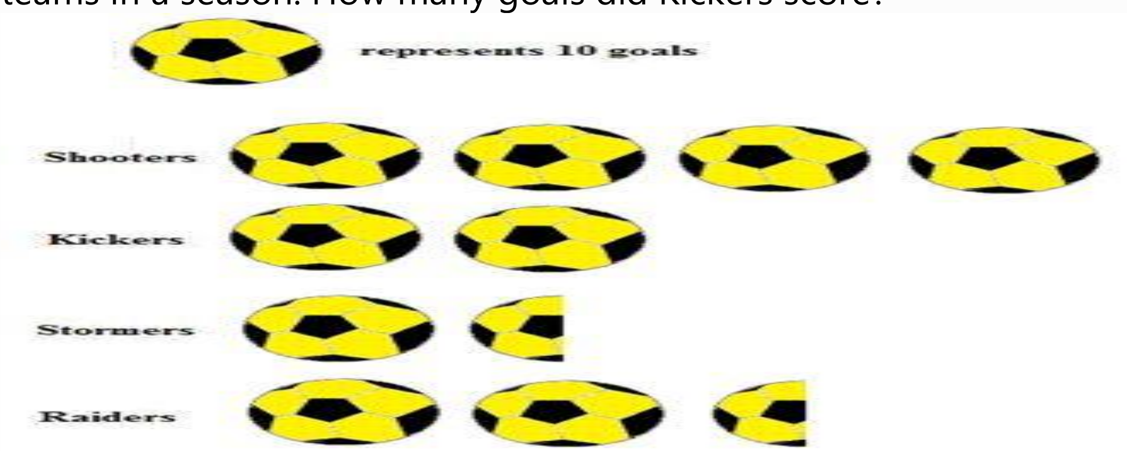
1. Following frequency distribution table shows marks (out of 50)

Class Interval	Frequency
0 – 10	1
10 – 20	6
20 – 30	20
30 – 40	12
40 – 50	6
Total	**45**

obtained in English by 45 students of class VI. Which two classes have the same frequency?

a. 10 – 20 and 40 – 50
b. None of these
c. 10 – 20 and 20 – 30
d. 20 – 30 and 40 – 50

2. The pictograph shows the numbers of goals scored by four soccer teams in a season. How many goals did Kickers score?



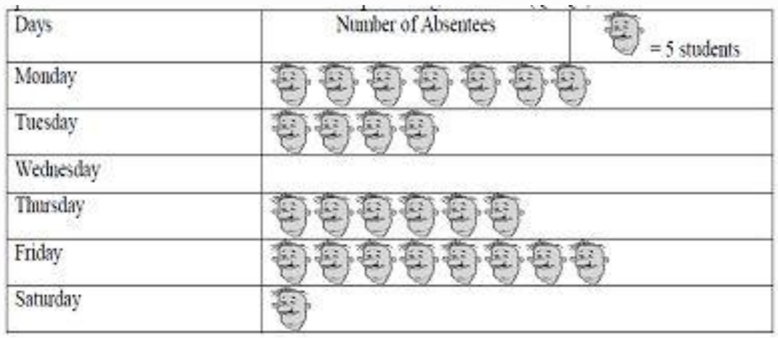
a. 20

b. None of these

c. 10

d. 15

3. The following pictograph shows the number of absentees in a class of 50 students during the previous week. On which day were the maximum number of students absent?



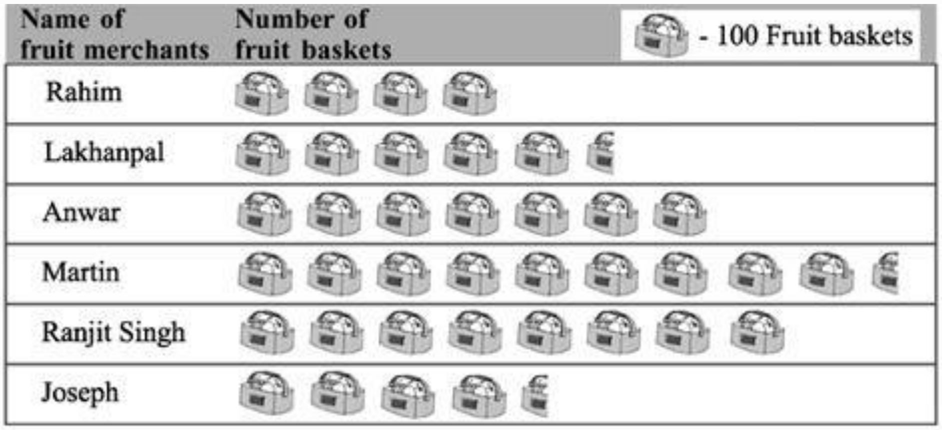
a. Saturday
b. Friday
c. Thursday
d. Wednesday

4. A ______ is a collection of numbers gathered to give some information.

a. Tally mark
b. Data
c. None of these
d. Frequency

5. In a village six fruit merchants sold the following number of fruit baskets in a particular season. How many fruit baskets were sold by

Rahim?



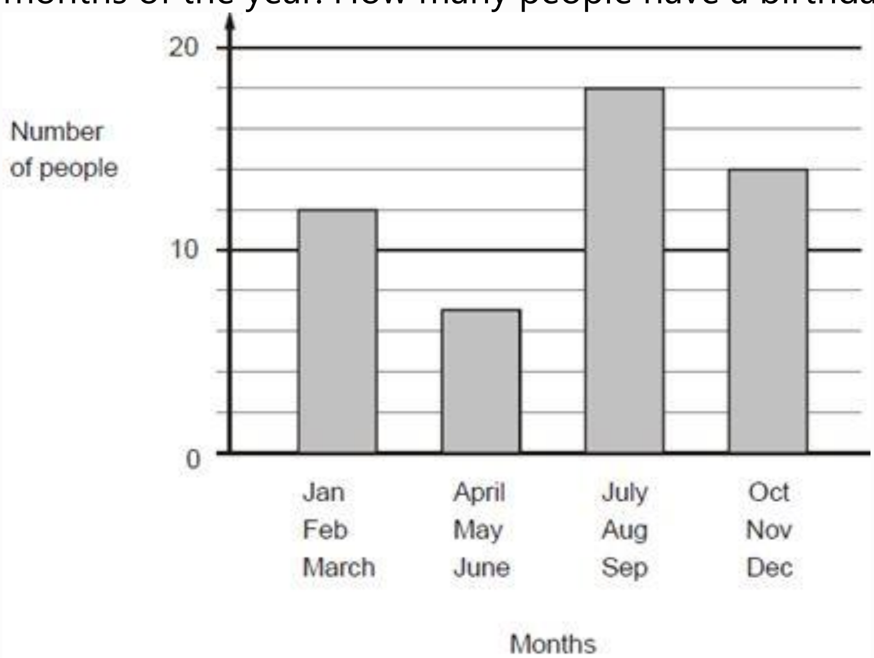
a. 700

b. 400

c. 500

d. 650

6. This chart shows the number of people with birthdays in each three months of the year. How many people have a birthday before July?



a. None of these

b. 7

c. 12

d. 19

7. **Match the following:-**

Column A	**Column B**
1. 	(a) 8
2. 	(b) 6
3. |||	(c) 5
4. 	(d) 3

8. **Fill up the following:**

   a. Representation of data with the help of tally marks is called ________.

   b. In a bar graph width of rectangle is always ________.

   c. The tally mark  represents _______.

   d. In a bar graph, ______ can be drawn horizontally and vertically.

9. **State true or false:**

   a. A bar graph represents data in the form of pictures, object or parts of objects.

   b. Data is a collection of numerical figures giving required information.

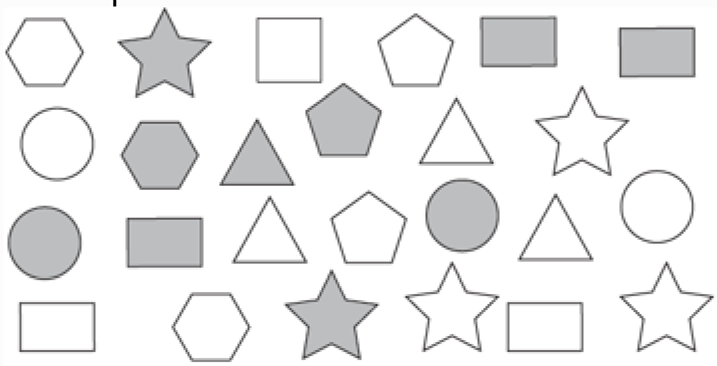
   c. In a bar graph width of rectangle is always equal.

   d. The tally mark  represents 5.

10. A collection of numbers gathered to give some information is called?

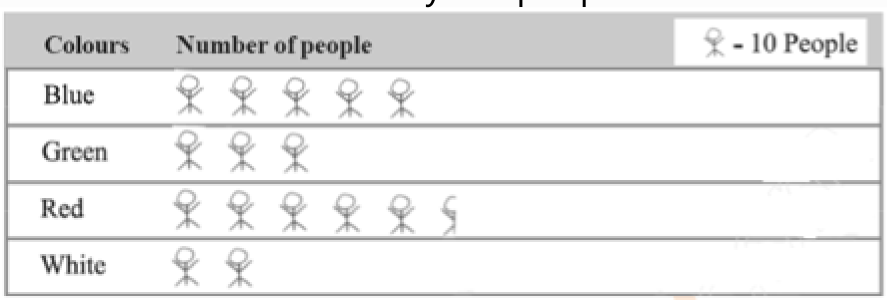
11. For a math assignment a group of students had to draw their favorite shapes.

The following pictures represent their choices. Each picture stands for 25 shapes.

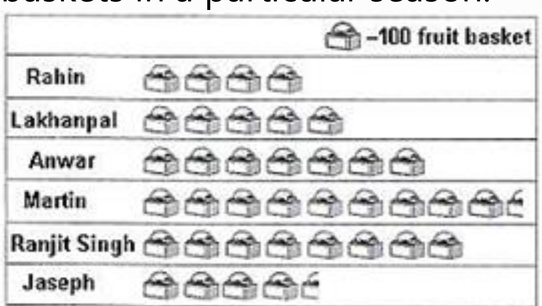


12. The colors of fridges preferred by people living in a locality are shown by the following pictograph

Which colour most liked by the people?



13. In a village six fruit merchants sold the following number of fruit baskets in a particular season:



Observe this pictograph and answer the following questions:

a. Which merchant sold the maximum number of baskets?

b. How many fruit baskets were sold by Answer?

c. The merchants who have sold 600 or more number of baskets are planning to buy a go down for the next season. Can you name them?

14. A survey of 120 school students was done to find which activity they prefer to do in their free time:

Preferred activity	**Number of Students**
Plying	45
Reading story books	30
Watching T.V.	20
Listening music	10
Painting	15

15. Draw a bar graph to illustrate the above data taking scale of 1unit length = 5 students. Which activity is preferred by most of the students other than playing?

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CLASS – 6

PLANNER AND ASSIGNMENT

TOPIC: PLAYING WITH NUMBERS

SUBTOPIC:

- **FACTORS AND MULTIPLES**
- **TEST OF DIVISIBILITY**
- **H.C.F. AND L.C.M.**

NUMBER OF BLOCKS: 6

GUIDELINES: REFER TO THE CONTENT GIVEN BELOW AND VIEW THE LINKS

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https://youtu.be/pcluEJNUNao

https://youtu.be/SkYBba2tCek

https://youtu.be/Xk8_7mWDfqg

LEARNING OBJECTIVES:

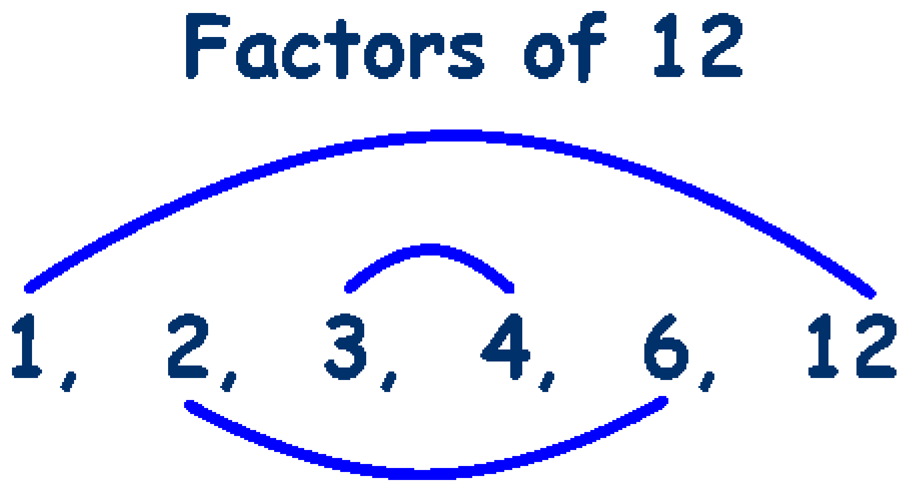
AT THE END OF THE LESSON STUDENTS WILL BW ABLE TO

- **UNDERSTAND FACTORS AND MULTIPLE**
- **OBSERVE THE DIVISIBILITY BY 2,3,4 ,5 ,6 ,7 ,8 ,9,10 AND 11**
- **FIND THE LCM AND HCF OF NUMBERS**

Playing with Numbers

Factors

The numbers which exactly divides the given number are called the **Factors** of that number.



As we can see that we get the number 12 by

1 × 12, 2 × 6, 3 × 4, 4 × 3, 6 × 2 and 12 ×1

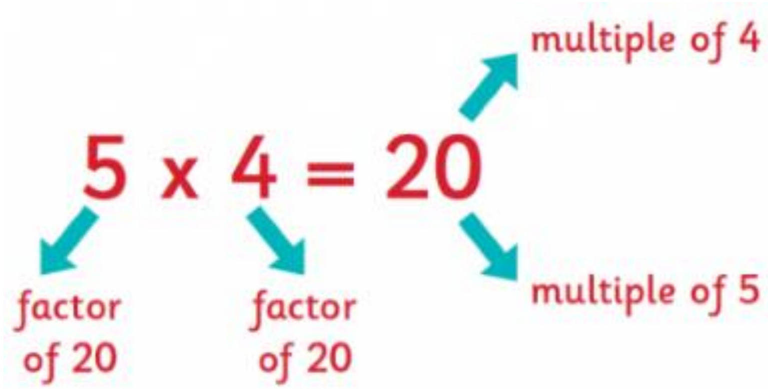
Hence,

1, 2, 3, 4, 6 and 12 are the factors of 12.

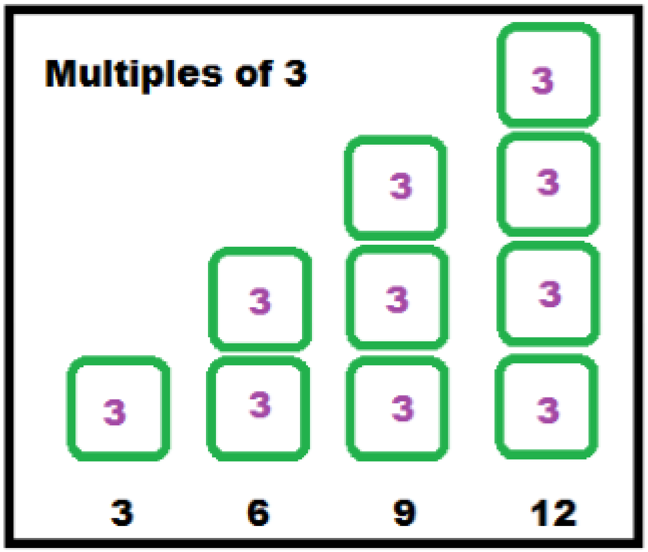
The factors are always less than or equal to the given number.

Multiples

If we say that 4 and 5 are the factors of 20 then 20 is the multiple of 4 and 5 both.



List the multiples of 3



Multiples are always more than or equal to the given number.

Some facts about Factors and Multiples

- 1 is the only number which is the factor of every number.
- Every number is the factor of itself.
- All the factors of any number are the exact divisor of that number.
- All the factors are less than or equal to the given number.
- There are limited numbers of factors of any given number.
- All the multiples of any number are greater than or equal to the given number.
- There are unlimited multiples of any given numbers.
- Every number is a multiple of itself.

Perfect Number

If the sum of all the factors of any number is equal to the double of that number then that number is called a **Perfect Number**.

Perfect Number	Factors	Sum of all the factors
6	1, 2, 3, 6	12
28	1, 2, 4, 7, 14, 28	56
496	1, 2, 4, 8, 16, 31, 62, 124, 248, 496	992

Prime Numbers

The numbers whose only factors are 1 and the number itself are called the **Prime Numbers**.

Like 2, 3, 5, 7, 11 etc.

Composite Numbers

All the numbers with more than 2 factors are called composite numbers or you can say that the numbers which are not prime numbers are called **Composite Numbers**.

Like 4, 6, 8, 10, 12 etc.

Remark: 1 is neither a prime nor a composite number.

Sieve of Eratosthenes Method

This is the method to find all the prime numbers from 1 to 100.

Step 1: First of all cross 1, as it is neither prime nor composite.
Step 2: Now mark 2 and cross all the multiples of 2 except 2.
Step 3: Mark 3 and cross all the multiples of 3 except 3.
Step 4: 4 is already crossed so mark 5 and cross all the multiples of 5 except 5.
Step 5: Continue this process until all the numbers are marked square or crossed.

This shows that all the covered numbers are prime numbers and all the crossed numbers are composite numbers except 1.

Even and Odd Numbers

All the multiples of 2 are **even numbers**. To check whether the number is even or not, we can check the number at one's place. If the number at ones place is 0,2,4,6 and 8 then the number is even number.
The numbers which are not even are called **Odd Numbers**.
Remark: 2 is the smallest even prime number. All the prime numbers except 2 are odd numbers.

Tests for Divisibility of Numbers

1. Divisibility by 2:

If there are any of the even numbers i.e. 0, 2, 4, 6 and 8 at the end of the digit then it is divisible by 2.

Example

Check whether the numbers 63 and 240 are divisible by 2 or not.

Solution:

1. The last digit of 63 is 3 i.e. odd number so 63 is not divisible by 2.

2. The last digit of 240 is 0 i.e. even number so 240 is divisible by 2.

2. Divisibility by 3:

A given number will only be divisible by 3 if the total of all the digits of that number is multiple of 3.

Example

Check whether the numbers 623 and 2400 are divisible by 3 or not.

Solution:

1. The sum of the digits of 623 i.e. 6 + 2 + 3 = 11, which is not the multiple of 3 so 623 is not divisible by 3.

2. The sum of the digits of 2400 i.e. 2 + 4 + 0 + 0 = 6, which is the multiple of 3 so 2400 is divisible by 3.

3. Divisibility by 4:

We have to check whether the last two digits of the given number are divisible by 4 or not. If it is divisible by 4 then the whole number will be divisible by 4.

Example

Check the number 23436 and 2582 are divisible by 4 or not.

Solution:

1. The last two digits of 23436 are 36 which are divisible by 4, so 23436 are divisible by 4.

2. The last two digits of 2582 are 82 which are not divisible by 4 so 2582 is not divisible by 4.

4. Divisibility by 5:

Any given number will be divisible by 5 if the last digit of that number is ‘0' or ‘5'.

Example

Check whether the numbers 2348 and 6300 are divisible by 5 or not.

Solution:

1. The last digit of 2348 is 8 so it is not divisible by 5.

2. The last digit of 6300 is 0 so it is divisible by 5.

5. Divisibility by 6:

Any given number will be divisible by 6 if it is divisible by 2 and 3 both. So we should do the divisibility test of 2 and 3 with the number and if it is divisible by both then it is divisible by 6 also.

Example

Check the number 342341 and 63000 are divisible by 6 or not.

Solution:

1. 342341 is not divisible by 2 as the digit at ones place is odd and is also not divisible by 3 as the sum of its digits i.e. 3 + 4 + 2 + 3 + 4 + 1 = 17 is also not divisible by 3.Hence 342341 is not divisible by 6.

2. 63000 is divisible by 2 as the digit at ones place is even and is also divisible by 3 as the sum of its digits i.e. 6 + 3 + 0 + 0 + 0 = 9 is divisible by 3.Hence 63000 is divisible by 6.

6. Divisibility by 7:

Any given number will be divisible by 7 if we double the last digit of the number and then subtract the result from the rest of the digits and check whether the remainder is divisible by 7 or not. If there is a large number of digits then we have to repeat the process until we get the number which could be checked for the divisibility of 7.

Example

Check the number 2030 is divisible by 7 or not.

Solution:

Given number is 2030

1. Double the last digit, $0 \times 2 = 0$

2. Subtract 0 from the remaining number 203 i.e. 203 – 0 = 203

3. Double the last digit, 3 × 2 = 6

4. Subtract 6 from the remaining number 20 i.e. 20 - 6 = 14

5. The remainder 14 is divisible by 7 hence the number 203 is divisible by 7.

7. Divisibility by 8:

We have to check whether the last three digits of the given number are divisible by 8 or not. If it is divisible by 8 then the whole number will be divisible by 8.

Example

Check whether the number 74640 is divisible by 8 or not.

Solution:

The last three digit of the number 74640 is 640.

As the number 640 is divisible by 8 hence the number 74640 is also divisible by 8.

8. Divisibility by 9:

Any given number will be divisible by 9 if the total of all the digits of that number is divisible by 9.

Example

Check whether the number 2320 and 6390 are divisible by 9 or not.

Solution:

1. The sum of the digits of 2320 is 2 + 3 + 2 + 0 = 7 which is not divisible by 9 so 2320 is not divisible by 9.

2. The sum of the digits of 6390 is 6 + 3 + 9 + 0 = 18 which is divisible by 9 so 6390 is divisible by 9.

9. Divisibility by 10:

Any given number will be divisible by 10 if the last digit of that number is zero.

Example

Check the number 123 and 2630 are divisible by 10 or not.

Solution:

1. The ones place digit is 3 in 123 so it is not divisible by 10.

2. The ones place digit is 0 in 2630 so it is divisible by 10.

Common Factors and Common Multiples

Example: 1

What are the common factors of 25 and 55?

Solution:

Factors of 25 are 1, 5.

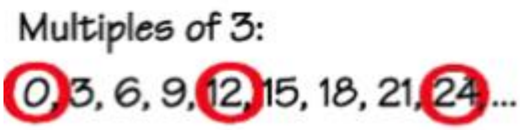
Factors of 55 are 1, 5, 11.

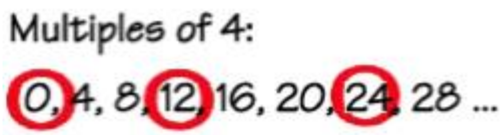
Common factors of 25 and 55 are 1 and 5.

Example: 2

Find the common multiples of 3 and 4.

Solution:





Common multiples of 3 and 4 are 0, 12, 24 and so on.

Co-prime Numbers

If 1 is the only common factor between two numbers then they are said to be **Co-prime Numbers**.

Example

Check whether 7 and 15 are co-prime numbers or not.

Solution:

Factors of 7 are 1 and 7.

Factors of 15 are 1, 3, 5 and 15.

The common factor of 7 and 15 is 1 only. Hence they are the co-prime numbers.

Some more Divisibility Rules

1. Let a and b are two given numbers. If a is divisible by b then it will be divisible by all the factors of b also.

If 24 is divisible by 12 then 24 will be divisible by all the factors of 12(i.e.2, 3, 4, 6) also.

2. Let a and b are two co-prime numbers. If c is divisible by a and b then c will be divisible by the product of a and b (ab) also.

If 24 is divisible by 2 and 3 which are the co-prime numbers then 24 will also be divisible by the product of 2 and 3 (2×3=6).

3. If a and b are divisible by c then a + b will also be divisible by c.

If 24 and 12 are divisible by 4 then 24 + 12 = 36 will also be divisible by 4.

4. If a and b are divisible by c then a-b will also be divisible by c.

If 24 and 12 are divisible by 4 then 24 -12 = 12 will also be divisible by 4.

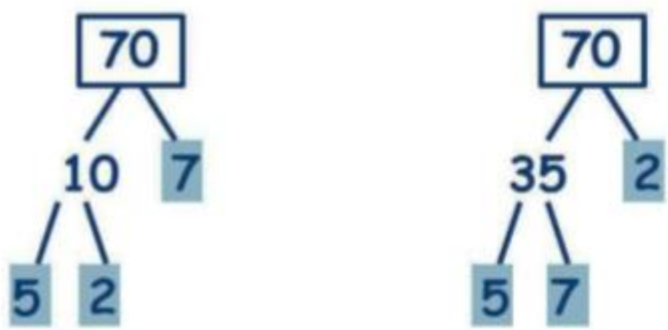
Prime Factorisation

Prime Factorisation is the process of finding all the prime factors of a number.

There are **two methods** to find the prime factors of a number-

1. Prime factorisation using a factor tree

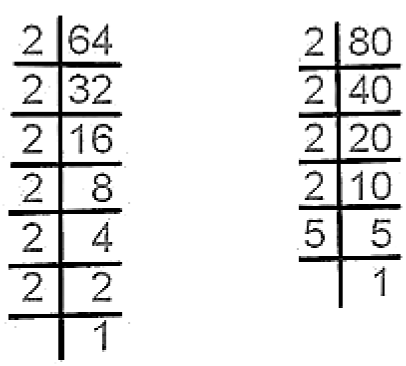
We can find the prime factors of 70 in two ways.



The prime factors of 70 are 2, 5 and 7 in both the cases.

2. Repeated Division Method

Find the prime factorisation of 64 and 80.



The prime factorisation of 64 is 2 × 2 × 2 × 2 × 2 × 2.

The prime factorisation of 80 is 2 × 2 × 2 × 2 × 5.

Highest Common Factor (HCF)

The highest common factor (HCF) of two or more given numbers is the greatest of their common factors.

Its other name is **(GCD) Greatest Common Divisor**.

Method to find HCF

To find the HCF of given numbers, we have to find the prime factorisation of each number and then find the HCF.

Example

Find the HCF of 60 and 72.

Solution:

First, we have to find the prime factorisation of 60 and 72.

Then encircle the common factors.

$$60 = 2 \times 2 \times 3 \times 5$$
$$72 = 2 \times 2 \times 2 \times 3 \times 3$$

HCF of 60 and 72 is 2 × 2 × 3 = 12.

Lowest Common Multiple (LCM)

The lowest common multiple of two or more given number is the smallest of their common multiples.

Methods to find LCM

1. Prime Factorisation Method

To find the LCM we have to find the prime factorisation of all the given numbers and then multiply all the prime factors which have occurred a maximum number of times.

Example

Find the LCM of 60 and 72.

Solution:

First, we have to find the prime factorisation of 60 and 72.

Then encircle the common factors.

$$60 = 2 \times 2 \times 3 \times 5$$
$$72 = 2 \times 2 \times 2 \times 3 \times 3$$

To find the LCM, we will count the common factors one time and multiply them with the other remaining factors.

LCM of 60 and 72 is 2 × 2 × 2 × 3 × 3 × 5 = 360

2. Repeated Division Method

If we have to find the LCM of so many numbers then we use this method.

Example

Find the LCM of 105, 216 and 314.

Solution:

Use the repeated division method on all the numbers together and divide until we get 1 in the last row.

2	105	216	314
2	105	108	157
2	105	54	157
3	105	27	157
3	35	9	157
3	35	3	157
5	35	1	157
7	7	1	157
157	1	1	157
	1	1	1

LCM of 105,216 and 314 is 2 × 2 × 2 × 3 × 3 × 3 × 5 × 7 × 157 = 1186920

Real life problems related to HCF and LCM
Example: 1

There are two containers having 240 litres and 1024 litres of petrol respectively. Calculate the maximum capacity of a container which can measure the petrol of both the containers when used an exact number of times.

Solution:

As we have to find the capacity of the container which is the exact divisor of the capacities of both the containers, i. e. **maximum capacity**, so we need to calculate the HCF.

2	240
2	120
2	60
2	30
3	15
5	5
	1

$240 = 2 \times 2 \times 2 \times 2 \times 3 \times 5$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$1024 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

The common factors of 240 and 1024 are 2 × 2 × 2 × 2. Thus, the HCF of 240 and 1024 is 16. Therefore, the maximum capacity of the required container is 16 litres.

Example: 2

What could be the least number which when we divide by 20, 25 and 30 leaves a remainder of 6 in every case?

Solution:

As we have to find the least number so we will calculate the LCM first.

2	20	25	30
2	10	25	15
3	5	25	15
5	5	25	5
5	1	5	1
	1	1	1

So, LCM = $2 \times 2 \times 3 \times 5 \times 5$.

LCM of 20, 25 and 30 is 2 × 2 × 3 × 5 × 5 = 300.

Here 300 is the least number which when divided by 20, 25 and 30 then they will leave remainder 0 in each case. But we have to find the least number which leaves remainder 6 in all cases. Hence, the required number is 6 more than 300.

The required least number = 300 + 6 = 306

Playing With Numbers:

Extra Questions Math

Question 1.
What is the sum of any two
(a) even numbers
(b) odd numbers?
Solution:
(a) The sum of any two even numbers is even.
Example: 4 (even) + 6 (even) = 10 (even)
(b) The sum of any two odd numbers is even.
Example: 5 (odd) + 7 (odd) = 12 (even)

Question 2.
Which of the following numbers is divisible by 3?
(a) 1212
(b) 625
Solution:
(a) Given number = 1212
Sum of the digits = 1 + 2 + 1 + 2 = 6, which is divisible by 3.
Hence, 1212 is also divisible by 3.
(b) Given number = 625
Sum of the digits = 6 + 2 + 5 = 13, which is not divisible by 3.
Hence, 625 is not divisible by 3.

Question 3.
If the LCM and HCF of any two numbers are 15 and 4 respectively, find the product of the numbers.
Solution:
We know that the product of the number = LCM x HCF = 15 x 4 = 60
Hence, the product of the given numbers = 60.

Question 4.
Find the HCF of 5 and 7.
Solution:

Given numbers are 5 and 7. We observe that 5 and 7 are co-prime numbers.
Hence, the HCF is 1.

Question 5.
Write first 3 multiples of 25.
Solution:
We have 25 x 1 = 25; 25 x 2 = 50; 25 x 3 = 75
Hence, the required multiples are 25, 50 and 75.

Question 6.
What are the possible factors of (a) 12 (b) 18?
Solution:
(a) Possible factors of 12 are:
12 = 1 x 12; 12 = 2 x 6; 12 = 3 x 4
Hence, the factors of 12 are 1, 2, 3, 4, 6 and 12.

(b) Possible factors of 18 are:
18 = 1 x 18; 18 = 2 x 9; 18 = 3 x 6
Hence, the factors of 18 are 1, 2, 3, 6, 9 and 18.

Question 7.
Write first three multiples of 11.
Solution:
First three multiples of 11 are:
11 x 1 = 11; 11 x 2 = 22; 11 x 3 = 33
Hence, the required multiples are: 11,22 and 33.

Question 8.
Write pairs of twin prime numbers less than 20.
Solution:
Pairs of twin prime numbers are: (3, 5), (5, 7), (11, 13), (17, 19).

Question 9.
Write the number which is even as well as prime.
Solution:
2 is the only even number which is prime number also.

Question 10.
What is the fundamental theorem of arithmetic?
Solution:
Every number greater than 1 has exactly one prime factorisation.

Playing With Numbers: Extra Questions Short Answer Type

Question 11.
Simplify: 32 + 96 ÷ (7 + 9)
Solution:
Given that: 32 + 96 ÷ (7 + 9)
= 32 + 96 ÷ 16 (Using BODMAS)
= 32 + 6 = 38

Question 12.
Simplify: 18 + {1 + (5 – 3) x 5}
Solution:
Given that: 18 + {1 + (5 – 3) x 5} (Using BODMAS)
= 18 + {1 + 2 x 5} = 18 + {1 + 10}
= 18 + 11 = 29.

Question 13.
Without actual division, show that 11 is a factor of 1,10,011.
Solution:
Here 1,10,011 = 1,10,000 + 11
= 11 x 10,000 + 11 x 1
= 11 x (10,000 + 1)
= 11 x 10,001
It is clear that 11 is a factor of 11 x 10,001.
Hence, 11 is a factor of 1,10,011.

Question 14.
The sum of two numbers is 25 and their product is 144. Find the numbers.
Solution:
The product of two numbers is 144.
∴ The possible factors are 1 x 144, 2 x 72, 3 x 48, 4 x 36, 6 x 24, 8 x 18, 9 x 16, 12 x 12
Here, we observe that out of these factors, we take 9 and 16.
Product = 9 x 16 = 144 and sum = 9 + 16 = 25
Hence, the required numbers are 9 and 16.

Question 15.
Is 80136 divisible by 11?
Solution:
Sum of the digits at odd places = 6 + 1 + 8 = 15
Sum of the digits at even places = 3 + 0 = 3
Difference of the two sums = 15 – 3 = 12,
which is neither 0 nor the multiple of 11.
Hence, 80136 is not divisible by 11.

Question 16.
The HCF and LCM of two numbers are 6 and 120 respectively. If one of the numbers is 24, find the other number.
Solution:
Given that: HCF = 6
LCM = 120
Let the two numbers be a and b, where a = 24, b = ?
We know that: a x b = HCF x LCM
⇒ 24 x b = 6 x 120
⇒ b = 6x12024
⇒ b = 30
Hence, the other number is 30.
Question 17.
Find the LCM of 12 and 30.
Solution:
Given numbers are 12 and 30
12 = 2 x 2 x 3;
30 = 2 x 3 x 5
∴ LCM = 2 x 2 x 3 x 5 = 60
Hence, the LCM of 12 and 30 = 60.

Question 18.
Find the smallest 4-digit number which is divisible by 18, 24 and 32.
Solution:
Given numbers are 18, 24 and 32, we have

2	18,	24,	32
2	9,	12,	16
2	9,	6,	8
2	9,	3,	4
2	9,	3,	2
3	9,	3,	1
3	3,	1,	1
	1,	1,	1

Thus, LCM = 2 x 2 x 2 x 2 x 2 x 3 x 3 = 288
The smallest 4-digit number = 1000
Now, we write multiples of 288, till we get a 4-digit number.
288 x 1 = 288, 288 x 2 = 576,
288 x 3 = 864, 288 x 4 = 1152
Hence, 1152 is the required number.

Question 19.
Find the greatest number which divides 82 and 132 leaving 1 and 6, respectively as

remainders.
Solution:
Given numbers are 82 and 132 and the remainders are 1 and 6 respectively.
We have, 82 – 1 = 81 and 132 – 6 = 126
So, we need to find the HCF of 81 and 126

$$81 = 3 \times \boxed{3} \times \boxed{3} \times 3$$
$$126 = 2 \times \boxed{3} \times \boxed{3} \times 7$$

Common factor is 3 (occurring twice).
∴ HCF = 3 x 3 = 9
Hence, the required number is 9.

Question 20.
Find the greatest number that will divide 455, 582 and 710 leaving remainders 14, 15 and 17 respectively.
Solution:
Given numbers are 455, 582 and 710 and the respective remainders are 14, 15 and 17.
We have 455 – 14 = 441, 582 – 15 = 567 and 710 – 17 = 693.
Now let us find their HCF.

$$441 = \boxed{3} \times 3 \times \boxed{7} \times 7$$
$$567 = \boxed{3} \times 3 \times 3 \times 3 \times \boxed{7}$$
$$693 = \boxed{3} \times 3 \times \boxed{7} \times 11$$

Common factors are 3 and 7.
∴ HCF = 3 x 7 = 21
Hence, the required number is 21.

Playing With Numbers Class 6 Extra Questions Long Answer Type

Question 21.
Simplify the following:
40 + [20 – {28 ÷ 7 – 3 + (30 – 5 of 4)}]
Solution:
Using BODMAS Rule, we have
40 + [20 – {28 ÷ 7 – 3 + (30 – 5 of 4)}]
= 40 + [20 – {28 ÷ 7 – 3 + (30 – 20)}]
= 40 + [20 – {28 ÷ 7 – 3 + 10}]
= 40 + [20 – [4 – 3 + 10}]
= 40 + [20-11] = 40 + 9 = 49.

Question 22.
Three sets of English, Hindi, and Urdu books are to be stacked in such a way that the

books are stored subjectwise and the height of each stack is the same. The numbers of English, Hindi and Urdu books are 336, 192 and 144 respectively. Assuring that the books have that same thickness, determine the number of stacks of English, Hindi and Urdu books.
Solution:
To arrange the books in the required way,
we have to find the greatest number that divides 336, 192 and 144 exactly.
So, HCF of 336, 192 and 144 is

$$336 = 2 \times 2 \times 2 \times 2 \times 3 \times 7$$
$$192 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$$
$$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

Common factors are 2 x 2 x 2 x 2 x 3 = 48
∴ HCF = 48, i.e. each stack contains 48 books.
∴ Number of stacks of English books = 336 + 48 = 7
Number of stacks of Hindi books = 192 4- 48 = 4
Number of stacks of Urdu books = 144 4- 48 = 3

Question 23.
Which of the following statements are true?
(a) 1371 is divisible by 3
(b) 1155 is not divisible by 9
(c) 1478 is not divisible by 4
(d) 2470 is divisible by 5
(e) If a number is divisible by 9, it is also divisible by 3.
(f) If a number is divisible by 3, it is also divisible by 9.
(g) The sum of any two odd numbers is even.
(h) If a number is divisible by 8, it must be divisible by 6.
(i) If a number is divisible by 3 and 6, it is divisible by 18.
(j) 1758 is not divisible by 8.
Solution:
(a) Yes, 1371 is divisible by 3. So it is true statement.
(b) Yes, 1155 is not divisible by 9. So it is true statement.
(c) Yes, 1478 is not divisible by 4. So it is true statement.
(d) Yes, 2470 is divisible by 5. So it is true statement.
(e) Yes, it is true statement. if No, it is not true statement.
(g) Yes, it is true statement.
(h) No, it is not true statement.
(i) No, it is not true statement.
(j) Yes, it is true statement.

Playing With Numbers Extra Questions Multiple Choice Type

Question 24.
Which of the following numbers is divisible by 11?
(a)112111
(b) 928389
(c) 12011
(d) 11111

Question 25.
Match column I with column II.

Column I	Column II
(a) A number divisible by 11	(i) 2
(b) HCF of two consecutive odd numbers	(ii) 4
(c) The difference between twin prime number	(iii) product of the number
(d) Number of factors of a prime number	(iv) 60
(e) Lowest composite number	(v)2
(f) LCM of 12 and 5	(vi) 4587594
(g) The smallest prime number	(vii) 1
(h) Product of HCF and LCM is equal to	(viii)

Playing With Numbers: Higher Order Thinking Skills (HOTS)

Question 26.
Ill cows, 185 sheep and 296 goats are to be taken across a river. There is only one boat and the boatsman says; he will take the same number and same kind of animals in each trip. Find the largest number of animals in each trip and the number of trips he will have to make.
Solution:
We have
Number of cows = 111
Number of sheep = 185
Number of goats = 296
According to the condition of the boatsman, we need to find HCF of 111, 185 and 296
111 = 3 x 37;
185 = 5 x 37;
296 = 2 x 2 x 2 x 37
∴ the HCF = 37
So, the number of animals of same kind = 37.
Number of trips
= 11137 + 18537 + 29637
= 3 + 5 + 8 = 16
Hence, the number of animals in each trip = 37
and the number of trips = 16.
Question 27.
In a seminar, the number of participants in Mathematics, Physics and Chemistry are 60,

96 and 144 respectively. Find the number of rooms required if in each room, the same number of ‘ participants are to be seated and all of them are to be in the same subject.
Solution:
The number of participants in each room must be the HCF of 60, 96 and 144.
∴ 60 = 2 x 2 x 3 x 5
96 = 2 x 2 x 2 x 2 x 2 x 3
144 = 2 x 2 x 2 x 2 x 3 x 3
HCF = 2 x 2 x 3 = 12
Number of rooms required
= 6012 + 9612 + 14412
= 5 + 8 + 12 = 25
Hence, number of participants = 12
in each room and number of rooms required = 25.

SUMMERY:

1. A number which divides a given number exactly is called a factor of the given number.

2. Every number is a factor of itself and 1 is a factor of every number.

3. Every number is a multiple of its factors.

4. Every factor is less than or equal to its multiple.

5. Every multiple of a given number is greater than or equal to that number.

6. A natural number which is not divisible by any number except 1 or itself is called prime number.

7. 2 is the only natural number which is even as well as prime. All the prime numbers except 2 are odd.

8. 2 is the smallest prime number.

9. Numbers which are not prime are called composite numbers.

10. 1 is neither prime nor composite number.

11. Two numbers are called co-prime if they have only 1 as common factor.

12. Pairs of prime numbers differ by 2 are called twin primes.

13. The factors of a given number are Finite but it may have infinite number of multiples.

14. Rule for divisibility:

- A number is divisible by 2 if it has 0 or even digits at its units place.
- A number is divisible by 3 if the sum of its digits is also divisible by 3.
- A number with 3 or more digits is divisible by 4 if the number found by last two digits of the number is divisible by 4.
- A number is divisible by 5, if it has only 0 or 5 in its units place.
- A number is divisible by 6, if it is divisible by 2 and 3 both.
- A number with 4 or more digits is divisible by 8 if the number formed by its last 3 digits are divisible by 8.
- A number is divisible by 9 if the sum of all the digits of the number is divisible by 9.
- A number is divisible by 11 if the difference between the sum of the digits at odd places taken from the right, and the sum of all the digits at even places is either 0 or divisible by 11.

15. The HCF of two or more given numbers is called the highest common factor.

16. The LCM of two or more given numbers is called lowest common multiple.

17. HCF of co-prime numbers is 1.

18. LCM of co-prime numbers is equal to their product.

19. Product of any two numbers is equal to the product of their HCF and LCM.

20. To simplify expressions involving brackets, the four fundamental operations (-, +, x, ÷) and ‘of operations, we always use the BODMAS Rule.

21. To simplify numerical expressions, we remove parenthesis ( ), curly brackets { } and square brackets [ ], strictly in this order.

ASSIGNMENT

Q1. Find the multiples of 7 which is greater than 56 but less than 77
Q2.Give at least common multiple of the two numbers.
(i) 3,9
(ii) 2,9
(iii) 4,6
(iv) 8,10
Q3. List all the common factors of the following:
(i) 12,18,21
(ii) 20,40,35
(iii) 16,18,7
Q4. Match the items in column I and column II.

COLUMN –I	COLUMN –II
(i)45	(A) multiple of 3
(ii)15	(B) factor of 40
(iii)24	(C) multiple of 7
(iv)20	(D) factor of 30
(v)35	(E) multiple of 9

Q5.Sort out even and odd numbers: 43, 48, 61, 69, 80, 155, 332, 264, 89, 19, 76, 125, 64
Q6. Express each of the following numbers as the sum of three odd prime numbers
(i) 31
(ii) 35
(iii) 49
(iv) 63
Q7. Write all prime numbers between 70 and 90.
Q8. Using divisibility test, determine which of the following numbers are divisible by 2; by 3; by 4; by 5; by 6; by 8; by 9; by 10; by 11.
(i)82956
(ii)187425
(iii)17322
(iv)53056
(v)76392
(vi)4578
(vii)962731
(viii)327850
Q9. Arrange the prime factors of 3350 in ascending order.
Q10. Use prime factorisation to find the H.C.F of the following:

(i) 70, 105, 175
(ii) 91, 175, 49
(iii) 66, 330
(iv) 34, 102
Q11. Find the L.C.M of the following by prime factorisation method:
(i) 42, 63, 162
(ii) 42, 78, 104, 112
(iii) 16, 28, 40, 77
(iv) 112, 168, 228
Q12. Find the greatest length of the rod which can measure exactly 42m, 49m and 84m. Find also the number of times the rod is contained in each length.
Q13. Telegraph poles occur at equal distances of 220 m along a road and heaps of stones are put at equal distances of 300 m along the same road. The first heap is at the foot of the first pole. How far from it along the road is the next heap which lies at the foot of a pole?
Q15. The length breadth and height of a room are 8 m 25 cm, 6 m 75 cm and 4 m 50 cm, respectively. Determine the longest tape which can measure the three dimensions of the room.
TRY THESE:
Q16. Find the greatest number such that if 285 and 1249 be divided by it, leaving the remainder 9 and 7 respectively.
Q17. Find the least number which when divided by 12, 15, 36 and 45 leaves in each case remainder 4.

Mount Abu Public School

H-Block, Sector-18, Rohini, New Delhi-110085 India

Class – 6

Planner and Assignment

FROM: 15 FEBRUARY TO 21 FEBRUARY

TOPIC: UNDERSTANDING ELEMENTARY SHAPES

SUBTOPIC:

- **ANGLE MADE BY TRANSVERSAL WITH TWO PARALLEL LINES**
- **TRIANGLES**

NUMBER OF BLOCKS: 4

GUIDELINES: REFER TO THE CONTENT GIVEN BELOW AND VIEW THE LINKS

- **THE NOTES GIVEN BELOW WILL HELP YOU TO UNDERSTAND THE CONCEPT AND COMPLETE THE ASSIGNMENT THAT FOLLOWS**
- **THE ASSIGNMENT IS TO BE DONE IN MATH NOTE BOOK**

INSTRUCTIONAL AIDS/RESOURCE

CHAPTER WILL BE EXPLAINED THROUGH POWERPOINT PRESENTATION AND VIDEOS THROUGH ZOOM CLASSES,

CLICK ON THE LINKS BELOW TO UNDERSTAND THE CONCEPTS MORE

- https://youtu.be/wadVW_JkbNw
- https://youtu.be/6RMN5Pf1fHU
- https://youtu.be/91llKGNjzMQ
- https://youtu.be/3hlibITOxLY

LEARNING OBJECTIVES

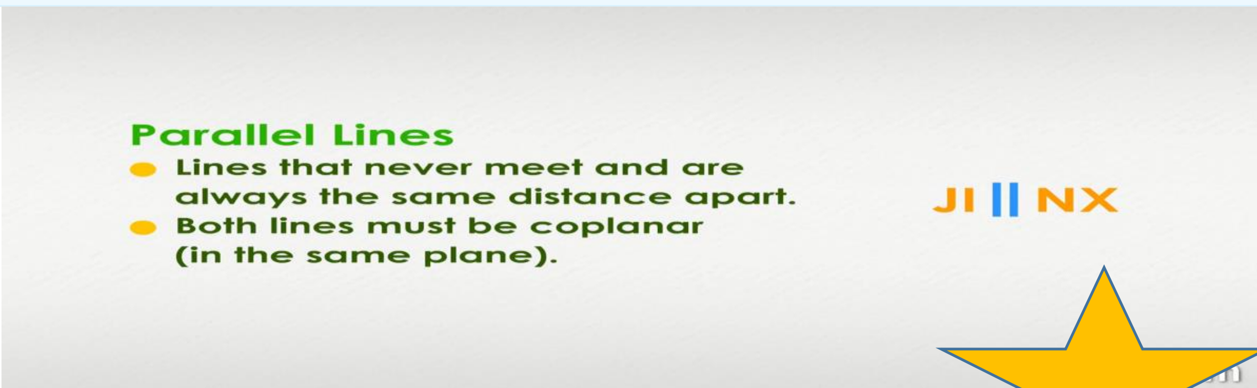
- **Distinguish between parallel line and intersecting line.**
- **Recognize various angles formed by transversal**
- **Observe different types triangles**
- **Recall various properties of triangle**

DEVELOPMENT OF THE CHAPTER:

What Makes Lines Parallel?

Two lines are parallel if they never meet and are always the same distance apart. Both lines must be coplanar (in the same plane). To use geometric shorthand, we write the symbol for parallel lines as two tiny *parallel lines*, like this:∥. For example, to say line JI is parallel to line NX, we write:

JI ∥ NX



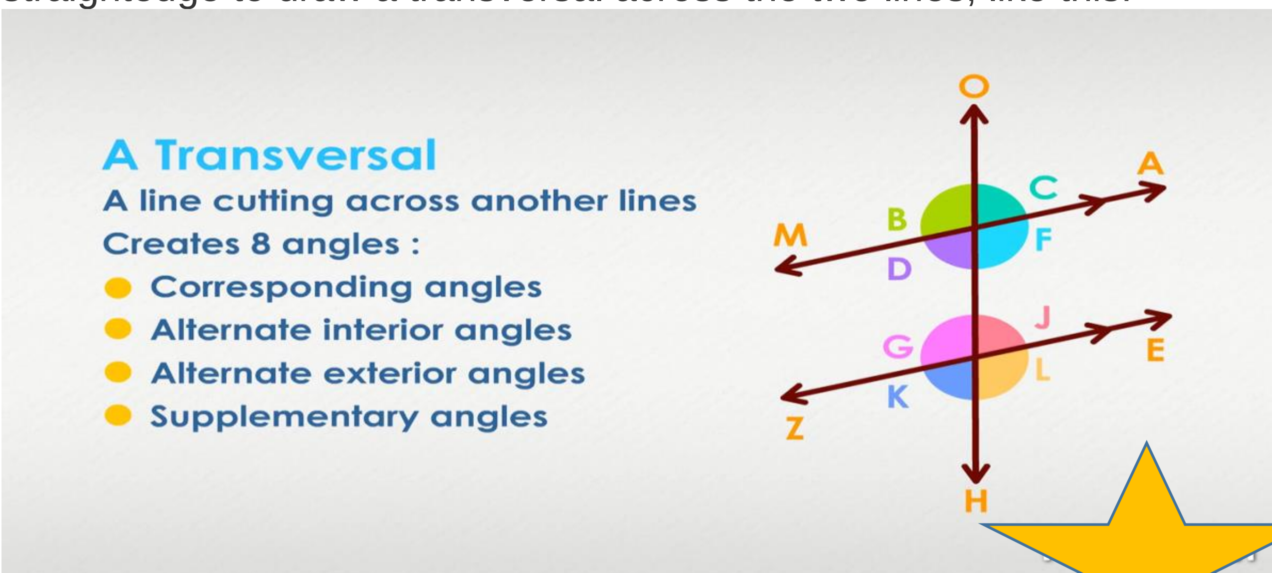
What are Parallel Lines in Real Life?

If you have ever stood on unused railroad tracks and wondered why they seem to meet at a point far away, you have experienced parallel lines (and perspective!). If the two rails met, the train could not move forward. Other parallel lines are all around you:

- Street markings
- Crosswalks
- Bookshelves
- Notebook paper

Parallel Lines Cut By A Transversal

A line cutting across another line is a **transversal**. When cutting across parallel lines, the transversal creates eight angles. Create a transversal using any existing pair of parallel lines, by using a straightedge to draw a transversal across the two lines, like this:



Proving Lines are Parallel

Those eight angles can be sorted out into pairs. Let's label the angles, using letters we have not used already:

Angles In Parallel Lines

These eight angles in parallel lines are:

1. Corresponding angles
2. Alternate interior angles
3. Alternate exterior angles
4. Supplementary angles

Every one of these has a postulate or theorem that can be used to **prove the two lines** MA **and** ZE **are parallel**. Let's go over each of them.

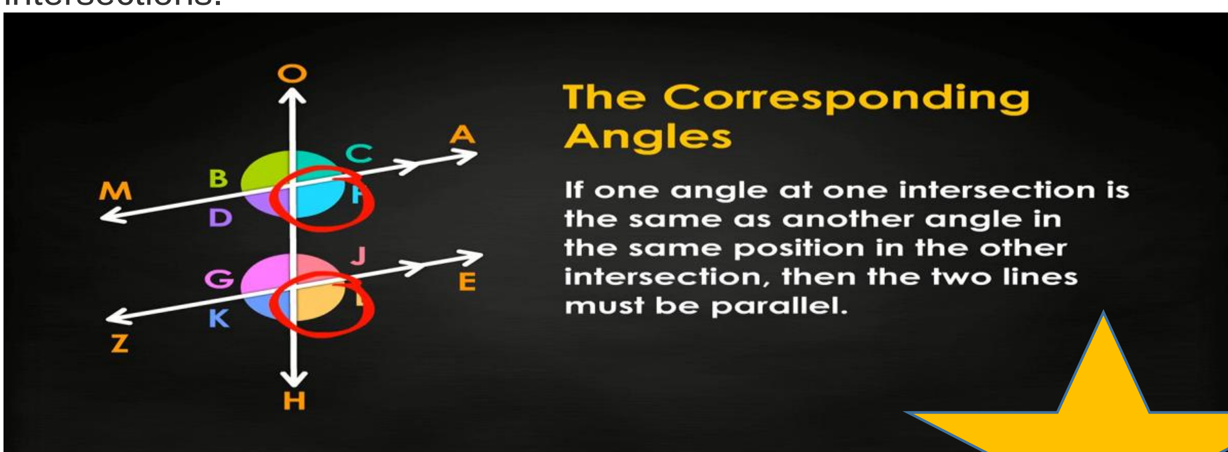
Corresponding Angles

The **Corresponding Angles Postulate** states that parallel lines cut by a transversal yield congruent corresponding angles. We want the converse of that, or the same idea the other way around:

If a transversal cuts across two lines to form two congruent, corresponding angles, then the two lines are parallel.

To know if we have two corresponding angles that are congruent, we need to know what **corresponding angles** are. In our drawing, transversal OH sliced through lines MA and ZE, leaving behind eight angles. Each slicing created an intersection.

If one angle at one intersection is the same as another angle in the same position in the other intersection, then the two lines must be parallel. Two angles are corresponding if they are in matching positions in both intersections.



In our drawing, the corresponding angles are:

∠B and ∠G

∠C and ∠J

∠F and ∠L

∠D and ∠K **If you check only a *single pair* of corresponding angles and they are equal, then the two lines are parallel.**

Alternate Angles

Alternate angles as a group subdivide into **alternate interior angles** and **alternate exterior angles**. Exterior angles lie outside the open space between the two lines suspected to be parallel. Interior angles lie within that open space between the two questioned lines.

In our drawing, ∠B,∠C, ∠K and ∠L are exterior angles. Can you identify the four *interior* angles?

Did you say ∠D, ∠F, ∠G and ∠J?

Alternate angles appear on either side of the transversal. They cannot by definition be on the same side of the transversal. In our drawing, ∠B is an alternate exterior angle with ∠L. ∠D is an alternate interior angle with ∠J. Can you find another pair of alternate exterior angles and another pair of alternate interior angles?

Here are both pairs of alternate exterior angles:

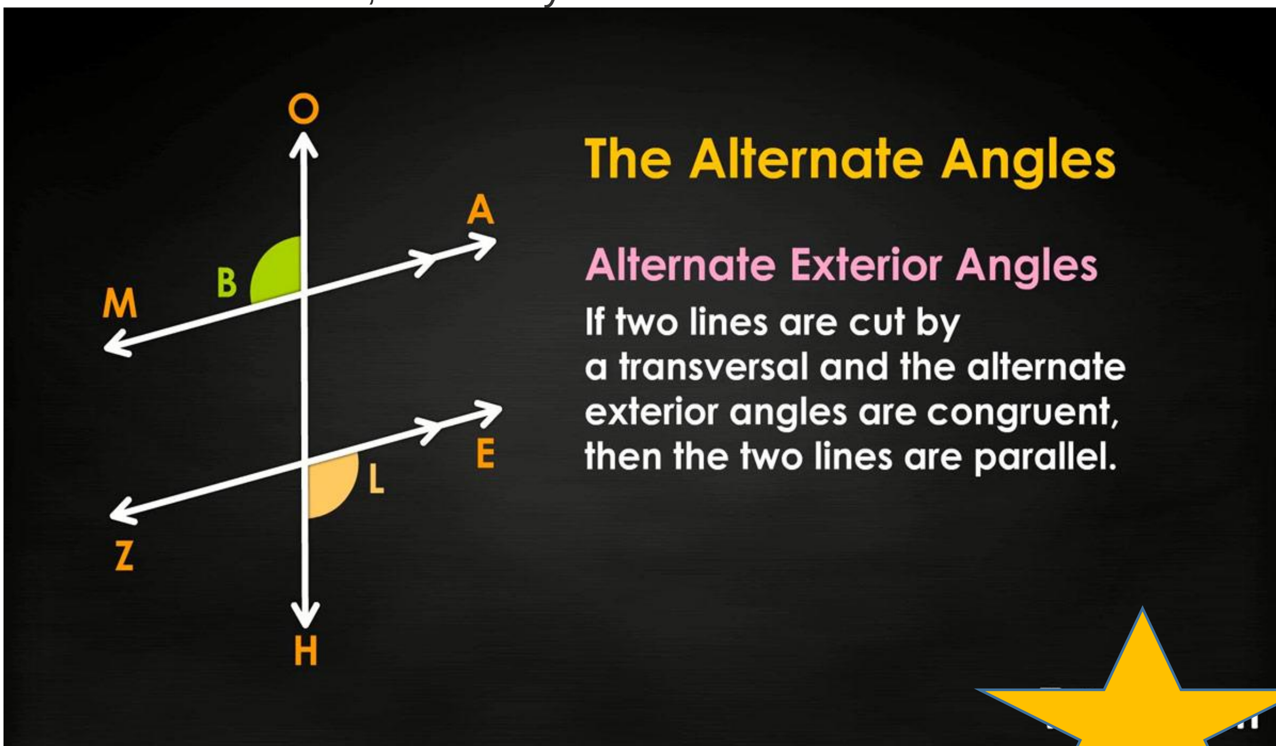
∠B and ∠L
∠C and ∠K

Here are both pairs of alternate interior angles:

∠D and ∠J
∠F and ∠G

Alternate Exterior Angles

If just one of our two pairs of alternate exterior angles are equal, then the two lines are parallel, because of the **Alternate Exterior Angle Converse Theorem**, which says:



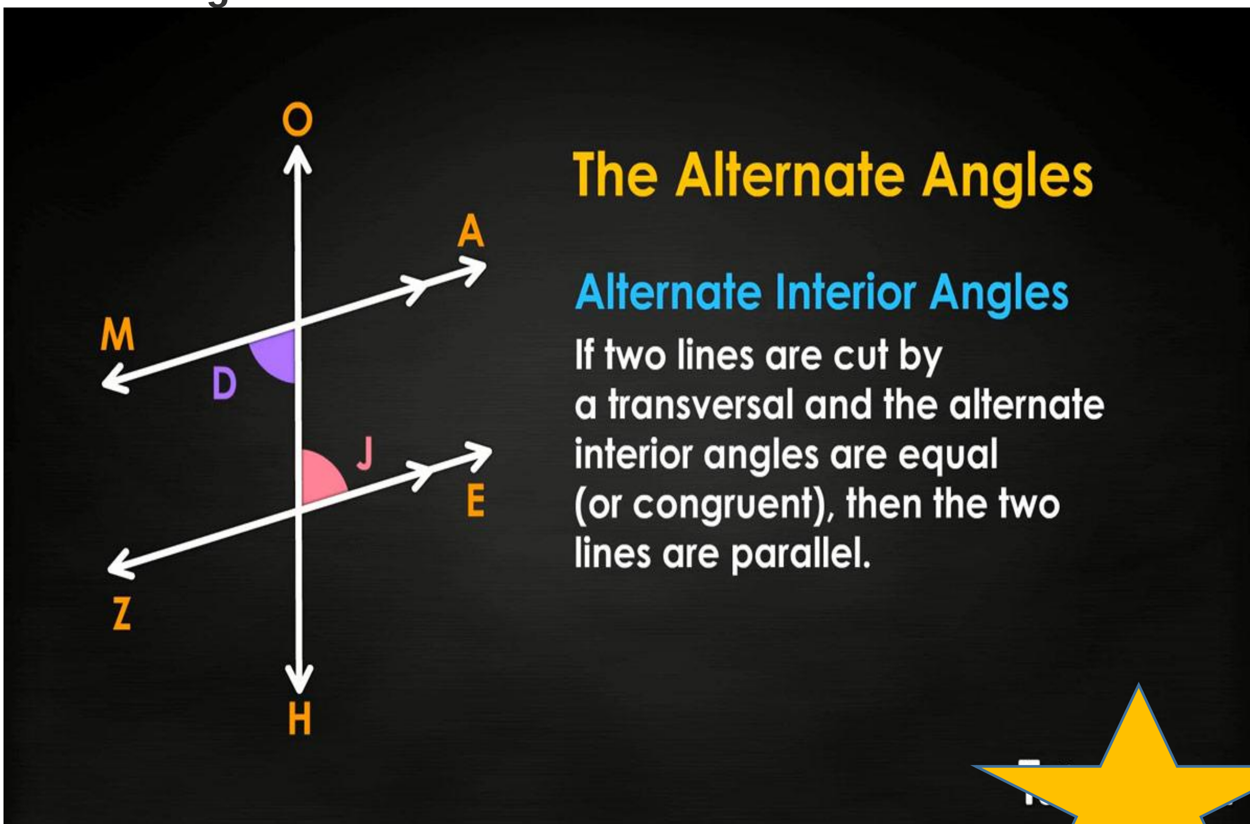
If two lines are cut by a transversal and the alternate exterior angles are equal, then the two lines are parallel.

Angles can be equal or **congruent**; you can replace the word "equal" in both theorems with "congruent" without affecting the theorem.

So if ∠B and ∠L are equal (or congruent), the lines are parallel. You could also only check ∠C and ∠K; if they are congruent, the lines are parallel. You need only check one pair!

Alternate Interior Angles

Just like the exterior angles, the four interior angles have a theorem and converse of the theorem. We are interested in the **Alternate Interior Angle Converse Theorem**:

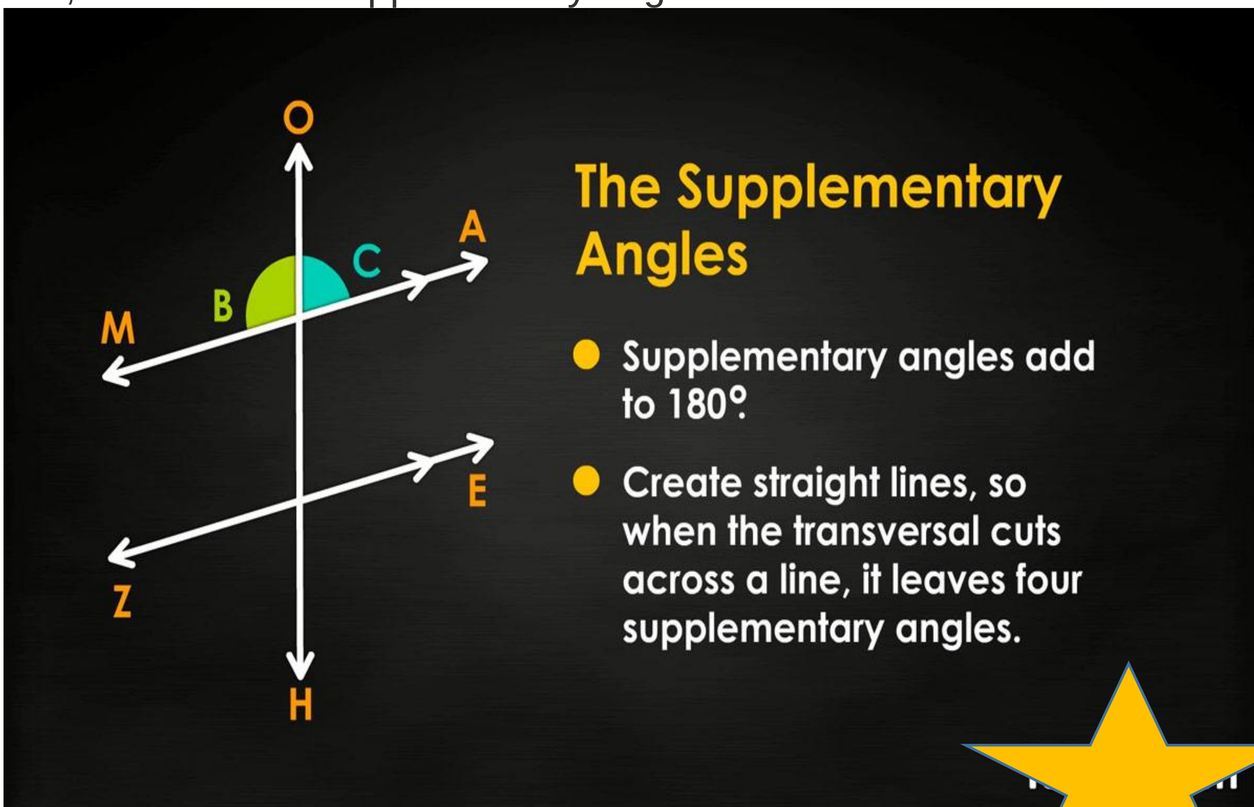


If two lines are cut by a transversal and the alternate interior angles are equal (or congruent), then the two lines are parallel.

So, in our drawing, if ∠D is congruent to ∠J, lines MA and ZE are parallel. Or, if ∠F is equal to ∠G, the lines are parallel. Again, you need only check one pair of alternate interior angles!

Supplementary Angles

Supplementary angles add to $180°$$180°$. **Supplementary angles** create straight lines, so when the transversal cuts across a line, it leaves four supplementary angles.



When a transversal cuts across lines suspected of being parallel, you might think it only creates eight supplementary angles, because you doubled the number of lines.

Not true! It creates more than eight!

In our main drawing, can you find all 12 supplementary angles?

Around the top intersection:

1. ∠B and ∠C
2. ∠C and ∠F
3. ∠F and ∠D
4. ∠D and ∠B

Around the bottom intersection:

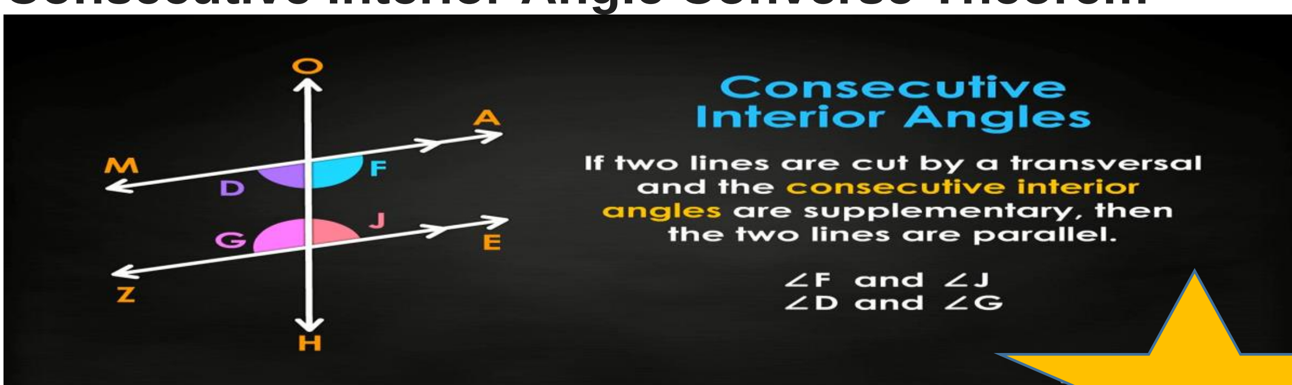
1. ∠G and ∠J
2. ∠J and ∠L
3. ∠L and ∠K
4. ∠K and ∠G

Those should have been obvious, but did you catch these four *other* supplementary angles?

1. ∠B and ∠K
2. ∠L and ∠C
3. ∠F and ∠J
4. ∠D and ∠G

These four pairs are supplementary because the transversal creates identical intersections for both lines (*only* if the lines are parallel). The last two supplementary angles are interior angle pairs, called **consecutive interior angles**.

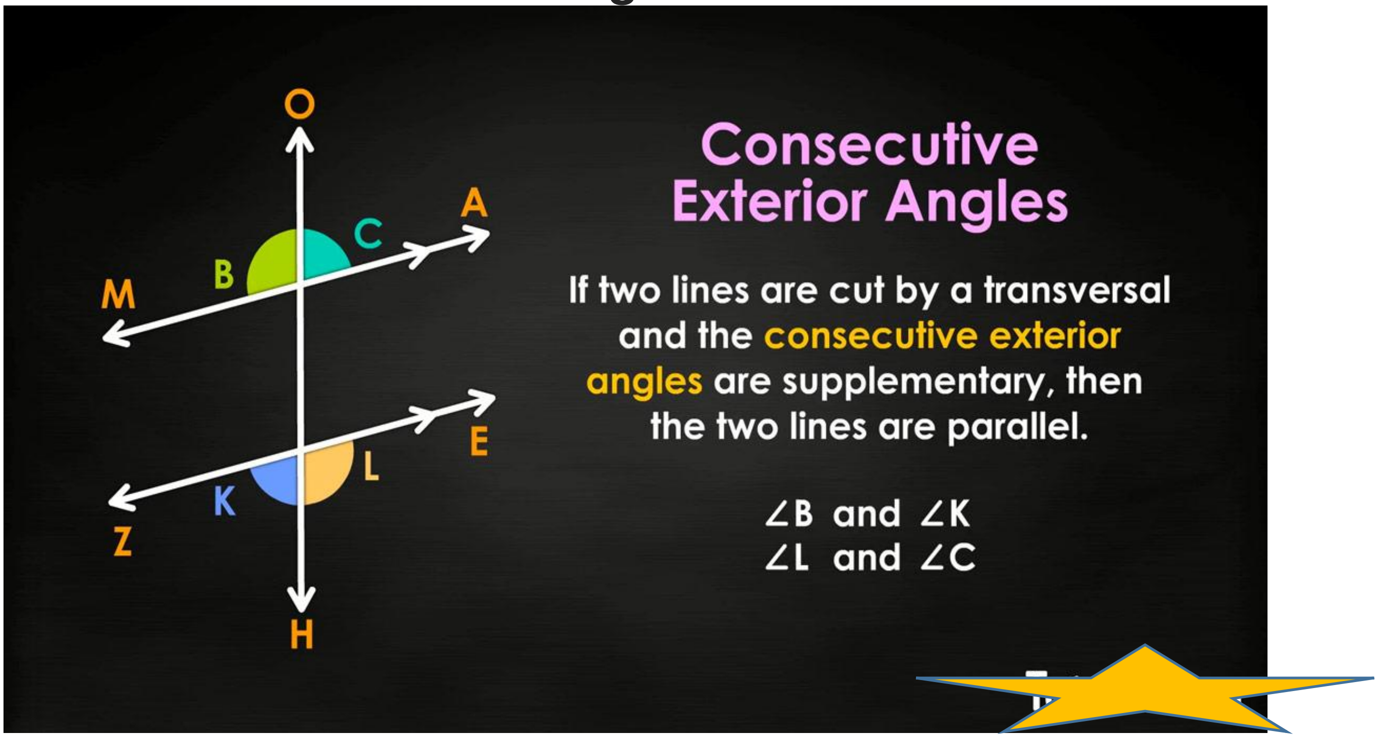
Consecutive Interior Angle Converse Theorem



If two lines are cut by a transversal and the consecutive <u>interior angles</u> are supplementary, then the two lines are parallel.

As you may suspect, if a converse Theorem exists for consecutive interior angles, it must also exist for **consecutive exterior angles**.

Consecutive Exterior Angle Converse Theorem



If two lines are cut by a transversal and the consecutive exterior angles are supplementary, then the two lines are parallel.

Consecutive exterior angles have to be on the same side of the transversal, and on the outside of the parallel lines. So, in our drawing, only these consecutive exterior angles are supplementary:

∠B and ∠K
∠L and ∠C

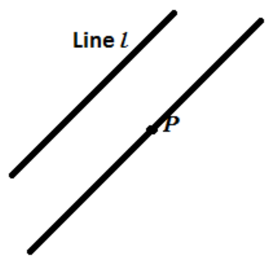
Lesson Summary

After careful study, you have now learned how to identify and know parallel lines, find examples of them in real life, construct a transversal, and state the several kinds of angles created when a transversal crosses parallel lines.

Those angles are corresponding angles, alternate interior angles, alternate exterior angles, and supplementary angles. Using those angles, you have learned many ways to prove that two lines are parallel.

Solved Examples for You

1: If l is any given line an P is any point not lying on l, then the number of parallel lines drawn through P, parallel to l would be:



A. **One**

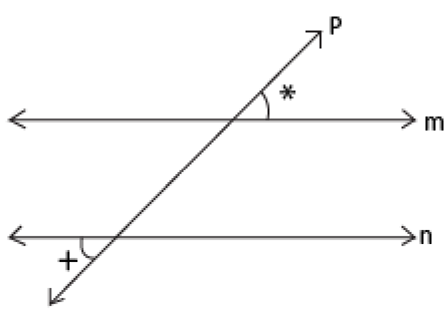
B. **Two**

C. **Infinite**

D. **None of these**

Answer : The correct option is A. Draw a line l and a point P not lying on l. Now we can draw a straight line parallel to l, which passes through P. We can see that only one line is drawn which is parallel to l and passes through P.

2: Identify the given angle in the diagram.



A. Corresponding Angles

B. Interior Angles

C. Alternate Angles

D. Alternate Exterior Angles

Answer : The correct option is D. The angles opposite to the sides of the transversal line and which is exterior is Alternate Exterior Angles.

3: What is an example of a corresponding angle?

Answer: You already know that the transversal is when a line crosses two other lines, similarly, the angles in matching corners are referred to as corresponding angles. For instance, 'a' and 'e' are corresponding angles. Thus, when these two lines are parallel, the corresponding angles are equal.

4: What is the sum of two corresponding angles?

Answer: As it is known that corresponding angles can be supplementary when the transversal intersects two parallel lines perpendicularly this is at 90 degrees. Thus, in such a case, each of the corresponding angles is going to be 90 degrees and their sum will add up to 180 degrees which is supplementary.

5: What is a transversal?

Answer: A transversal refers to a line which passes through two lines lying in the same plane at two different points. Moreover, in the transversal, the two certain lines can be parallel or non-parallel. Thus, the angles which form when a transversal intersects two lines are corresponding angles and alternate angles.

6: State the properties of a transversal.

Answer: The properties of a transversal are that first one being over here, the vertically opposite angles are equal. Further, the corresponding angles are equal and the interior angles which form on the same side of the transversal are supplementary. Finally, the alternate angles are equal.

7: In Fig. 58, line n is a transversal to line l and m. Identify the following:

(i) Alternate and corresponding angles in Fig. 58 (i)

(ii) Angles alternate to ∠d and ∠g and angles corresponding to ∠f and ∠h in Fig. 58 (ii)

(iii) Angle alternate to ∠PQR, angle corresponding to ∠RQF and angle alternate to ∠PQE in Fig. 58 (iii)

(iv) Pairs of interior and exterior angles on the same side of the transversal in Fig. 58 (ii)

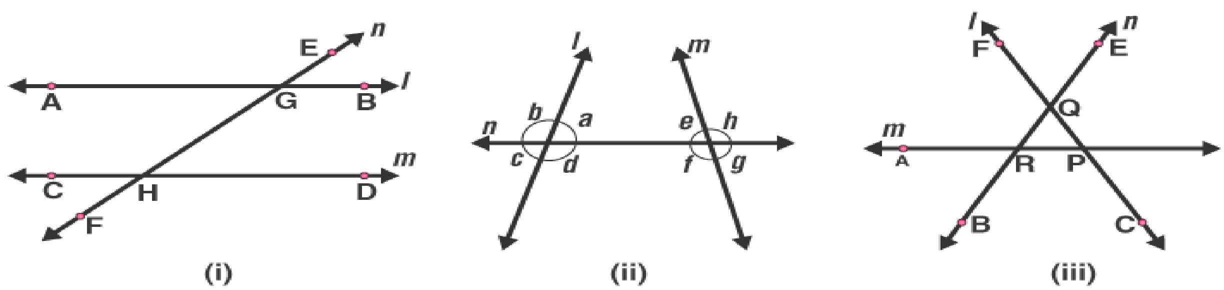


Fig.58

Solution:

(i) A pair of angles in which one arm of both the angles is on the same side of the transversal and their other arms are directed in the same sense is called a pair of corresponding angles.

In Figure (i) Corresponding angles are

∠EGB and ∠GHD

∠HGB and ∠FHD

∠EGA and ∠GHC

∠AGH and ∠CHF

A pair of angles in which one arm of each of the angle is on opposite sides of the transversal and whose other arms include the one segment is called a pair of alternate angles.

The alternate angles are:

∠EGB and ∠CHF

∠HGB and ∠CHG

∠EGA and ∠FHD

∠AGH and ∠GHD

(ii) In Figure (ii)

The alternate angle to ∠d is ∠e.

The alternate angle to ∠g is ∠b.

The corresponding angle to ∠f is ∠c.

The corresponding angle to ∠h is ∠a.

(iii) In Figure (iii)

Angle alternate to ∠PQR is ∠QRA.

Angle corresponding to ∠RQF is ∠ARB.

Angle alternate to ∠POE is ∠ARB.

(iv) In Figure (ii)

Pair of interior angles are

∠a is ∠e.

∠d is ∠f.

Pair of exterior angles are

∠b is ∠h.

∠c is ∠g.

8 In Fig. 59, AB and CD are parallel lines intersected by a transversal PQ at L and M respectively, If ∠CMQ = 60º, find all other angles in the figure.

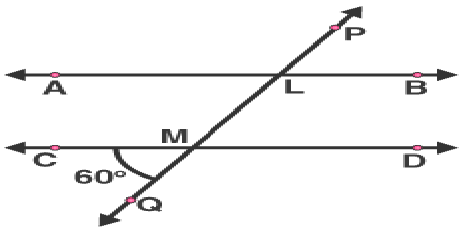


Fig. 59

Solution:

A pair of angles in which one arm of both the angles is on the same side of the transversal and their other arms are directed in the same sense is called a pair of corresponding angles.

Therefore corresponding angles are

∠ALM = ∠CMQ = 60º [given]

Vertically opposite angles are

∠LMD = ∠CMQ = 60º [given]

Vertically opposite angles are

∠ALM = ∠PLB = 60º

Here, ∠CMQ + ∠QMD = 180º are the linear pair

On rearranging we get

∠QMD = 180º – 60º

= 120º

Corresponding angles are

∠QMD = ∠MLB = 120º

Vertically opposite angles

∠QMD = ∠CML = 120º

Vertically opposite angles

∠MLB = ∠ALP = 120º

9. In Fig. 60, AB and CD are parallel lines intersected by a transversal by a transversal PQ at L and M respectively. If ∠LMD = 35º find ∠ALM and ∠PLA.

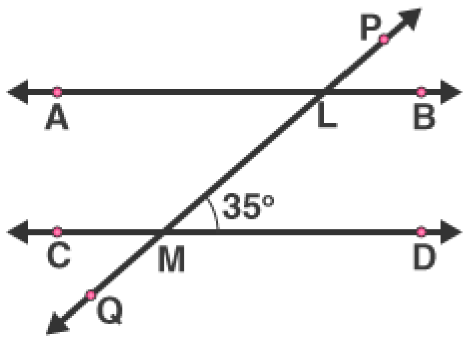


Fig. 60

Solution:

Given that, ∠LMD = 35º

From the figure we can write

∠LMD and ∠LMC is a linear pair

∠LMD + ∠LMC = 180º [sum of angles in linear pair = 180º]

On rearranging, we get

∠LMC = 180º – 35º

= 145º

So, ∠LMC = ∠PLA = 145º

And, ∠LMC = ∠MLB = 145º

∠MLB and ∠ALM is a linear pair

∠MLB + ∠ALM = 180º [sum of angles in linear pair = 180º]

∠ALM = 180º – 145º

∠ALM = 35^0

Therefore, ∠ALM = 35º, ∠PLA = 145º.

10. The line n is transversal to line l and m in Fig. 61. Identify the angle alternate to ∠13, angle corresponding to ∠15, and angle alternate to ∠15.

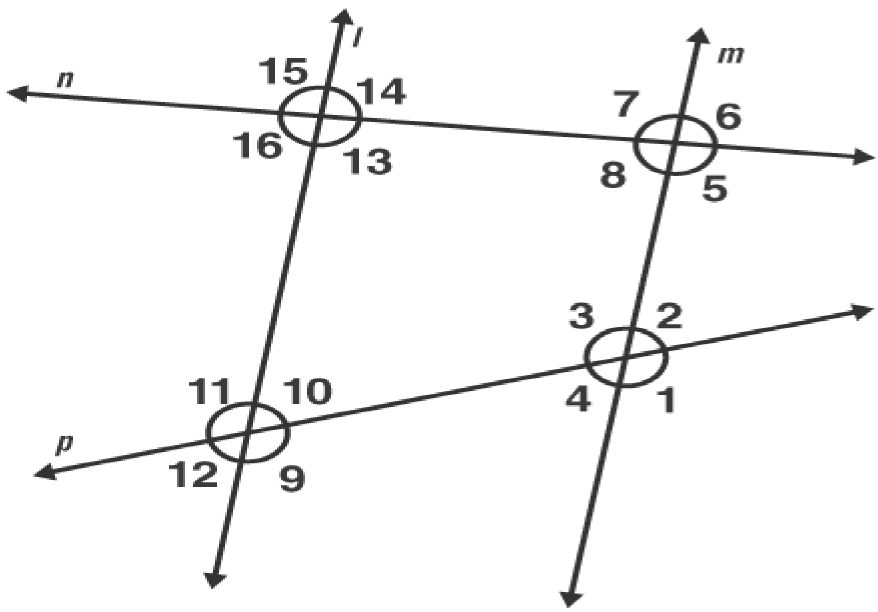


Fig.61

Solution:

Given that, l ‖ m

From the figure the angle alternate to ∠13 is ∠7

From the figure the angle corresponding to ∠15 is ∠7 [A pair of angles in which one arm of both the angles is on the same side of the transversal and their other arms are directed in the same sense is called a pair of corresponding angles.]

Again from the figure angle alternate to ∠15 is ∠5

11. In Fig. 62, line l ∥ m and n is transversal. If ∠1 = 40°, find all the angles and check that all corresponding angles and alternate angles are equal.

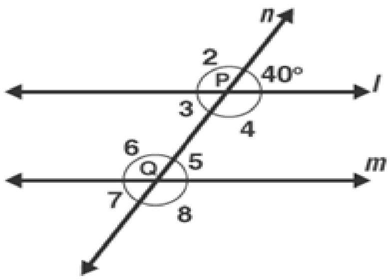


Fig. 62

Solution:

Given that, $\angle 1 = 40^o$

$\angle 1$ and $\angle 2$ is a linear pair [from the figure]

$\angle 1 + \angle 2 = 180^o$

$\angle 2 = 180^o - 40^o$

$\angle 2 = 140^o$

Again from the figure we can say that

$\angle 2$ and $\angle 6$ is a corresponding angle pair

So, $\angle 6 = 140^o$

$\angle 6$ and $\angle 5$ is a linear pair [from the figure]

$\angle 6 + \angle 5 = 180^o$

$\angle 5 = 180^o - 140^o$

$\angle 5 = 40^o$

From the figure we can write as

$\angle 3$ and $\angle 5$ are alternate interior angles

So, $\angle 5 = \angle 3 = 40^o$

$\angle 3$ and $\angle 4$ is a linear pair

$\angle 3 + \angle 4 = 180^o$

$\angle 4 = 180^o - 40^o$

$\angle 4 = 140^o$

Now, $\angle 4$ and $\angle 6$ are a pair of interior angles

So, $\angle 4 = \angle 6 = 140^o$

$\angle 3$ and $\angle 7$ are a pair of corresponding angles

So, $\angle 3 = \angle 7 = 40^o$

Therefore, $\angle 7 = 40^o$

$\angle 4$ and $\angle 8$ are a pair of corresponding angles

So, $\angle 4 = \angle 8 = 140^o$

Therefore, $\angle 8 = 140^o$

Therefore, $\angle 1 = 40^o$, $\angle 2 = 140^o$, $\angle 3 = 40^o$, $\angle 4 = 140^o$, $\angle 5 = 40^o$, $\angle 6 = 140^o$, $\angle 7 = 40^o$ and $\angle 8 = 140^o$

12. In Fig.63, line l ∥ m and a transversal n cuts them P and Q respectively. If ∠1 = 75°, find all other angles.

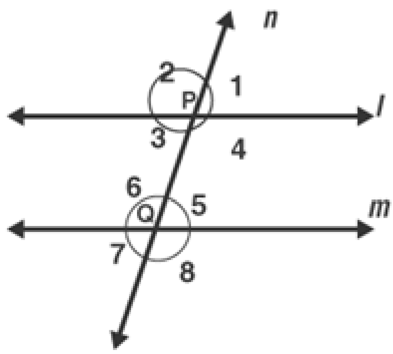


Fig. 63

Solution:

Given that, l ∥ m and $\angle 1 = 75^o$

$\angle 1 = \angle 3$ are vertically opposite angles

We know that, from the figure

$\angle 1 + \angle 2 = 180^o$ is a linear pair

$\angle 2 = 180^o - 75^o$

$\angle 2 = 105^o$

Here, $\angle 1 = \angle 5 = 75^o$ are corresponding angles

$\angle 5 = \angle 7 = 75^o$ are vertically opposite angles.

$\angle 2 = \angle 6 = 105^o$ are corresponding angles

$\angle 6 = \angle 8 = 105^o$ are vertically opposite angles

$\angle 2 = \angle 4 = 105^o$ are vertically opposite angles

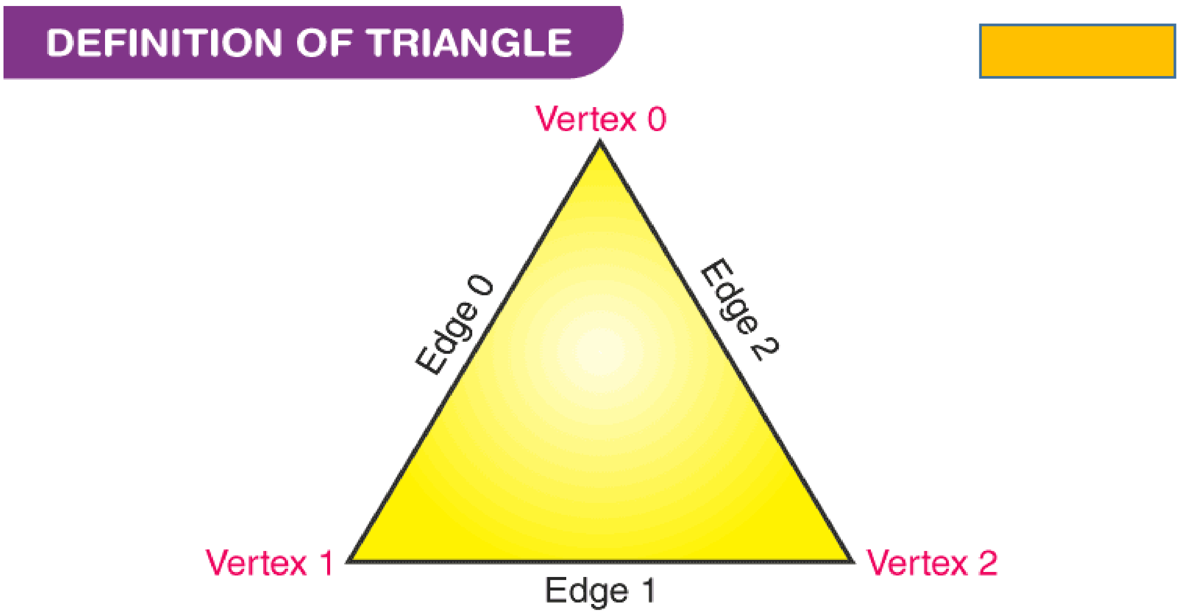
So, $\angle 1 = 75^o$, $\angle 2 = 105^o$, $\angle 3 = 75^o$, $\angle 4 = 105^o$, $\angle 5 = 75^o$, $\angle 6 = 105^o$, $\angle 7 = 75^o$ and $\angle 8 = 105$

Triangles

In Geometry, a **triangle** is a three-sided polygon that consists of three edges and three vertices. The most important property of a triangle is that the **sum of the internal angles of a triangle is equal to 180 degrees**. This property is called angle sum property of triangle.

If ABC is a triangle, then it is denoted as ∆ABC, where A, B and C are the vertices of the triangle. A triangle is a two-dimensional shape, in Euclidean geometry, which is seen as three non-collinear points in a unique plane.

Below given is a triangle having three sides and three edges, which are numbered as 0,1,2.



Definition

As we discussed in the introduction, a triangle is a type of polygon, which has three sides, and the two sides are joined end to end is called the vertex of the triangle. An angle is formed between two sides. This is one of the important parts of geometry.

Some major concepts, such as Pythagoras theorem and trigonometry, are dependent on triangle properties. A triangle has different types based on its angles and sides.

Shape of Triangle

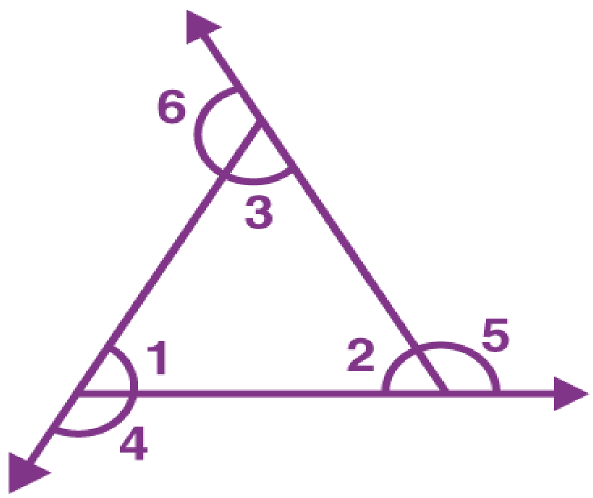
Triangle is a closed two-dimensional shape. It is a three-sided polygon. All sides are made of straight lines. The point where two straight lines join is the vertex. Hence, the triangle has three vertices. Each vertex forms an angle.

Angles of Triangle

There are three angles in a triangle. These angles are formed by two sides of the triangle, which meets at a common point, known as the vertex. The sum of all three interior angles is equal to 180 degrees.

If we extend the side length outwards, then it forms an exterior angle. The sum of consecutive interior and exterior angles of a triangle is supplementary.

Let us say, ∠1, ∠2 and ∠3 are the interior angles of a triangle. When we extend the sides of the triangle in the outward direction, then the three exterior angles formed are ∠4, ∠5 and ∠6, which are consecutive to ∠1, ∠2 and ∠3, respectively.



Hence,

$\angle 1 + \angle 4 = 180°$ ……(i)

$\angle 2 + \angle 5 = 180°$ …..(ii)

$\angle 3 + \angle 6 = 180°$ …..(iii)

If we add the above three equations, we get;

$\angle 1+\angle 2+\angle 3+\angle 4+\angle 5+\angle 6 = 180° + 180° + 180°$

Now, by angle sum property we know,

$\angle 1+\angle 2+\angle 3 = 180°$

Therefore,

$180 + \angle 4+\angle 5+\angle 6 = 180° + 180° + 180°$

$\angle 4+\angle 5+\angle 6 = 360°$

This proves that the sum of the exterior angles of a triangle is equal to 360 degrees.

Properties

Each and every shape in Maths has some properties which distinguish them from each other. Let us discuss here some of the properties of triangles.

1. A triangle has three sides and three angles.
2. The sum of the angles of a triangle is always **180 degrees**.
3. The exterior angles of a triangle always add up to **360 degrees**.
4. The sum of consecutive interior and exterior angle is supplementary.
5. The sum of the lengths of any two sides of a triangle is greater than the length of the third side. Similarly, the difference between the lengths of any two sides of a triangle is less than the length of the third side.
6. The shortest side is always opposite the smallest interior angle. Similarly, the longest side is always opposite the largest interior angle.

Types

On the basis of length of the sides, triangles are classified into three categories:

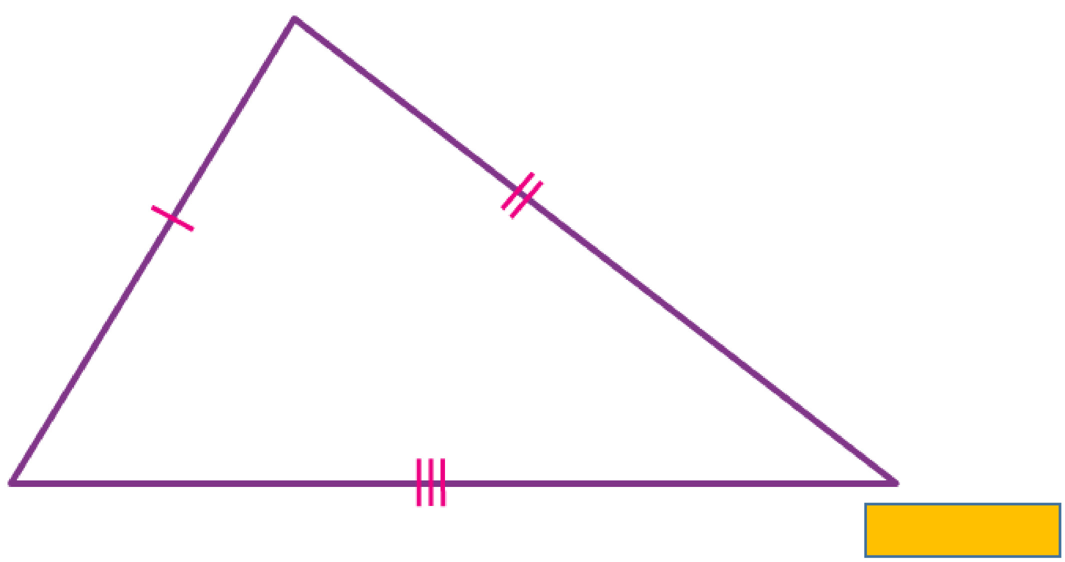
1. Scalene Triangle
2. Isosceles Triangle
3. Equilateral Triangle

On the basis of measurement of the angles, triangles are classified into three categories:

1. Acute Angle Triangle
2. Right Angle Triangle
3. Obtuse Angle Triangle

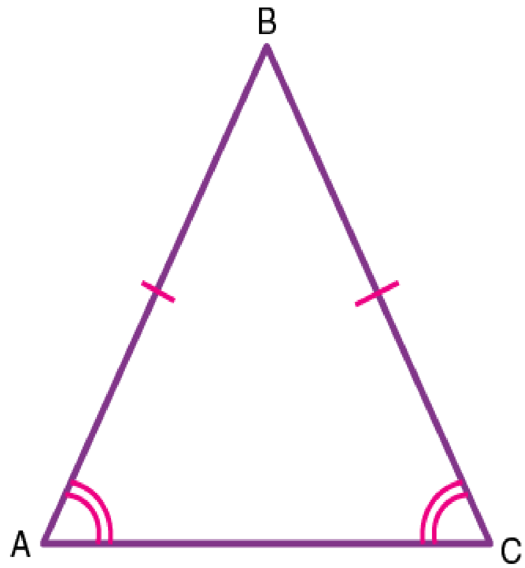
Scalene Triangle

A scalene triangle is a type of triangle, in which all the three sides have different side measures. Due to this, the three angles are also different from each other.



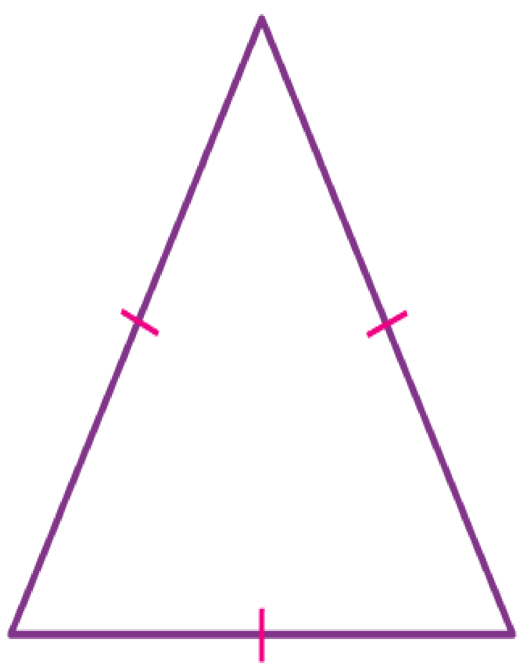
Isosceles Triangle

In an isosceles triangle, two sides have equal length. The two angles opposite to the two equal sides are also equal to each other.



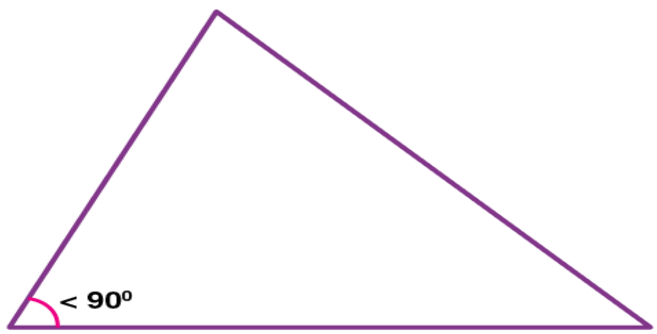
Equilateral Triangle

An equilateral triangle has all three sides equal to each other. Due to this all the internal angles are of equal degrees, i.e. each of the angles is 60°



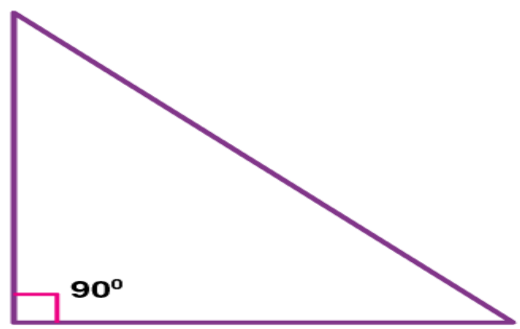
Acute Angled Triangle

An acute triangle has all of its angles less than 90°.



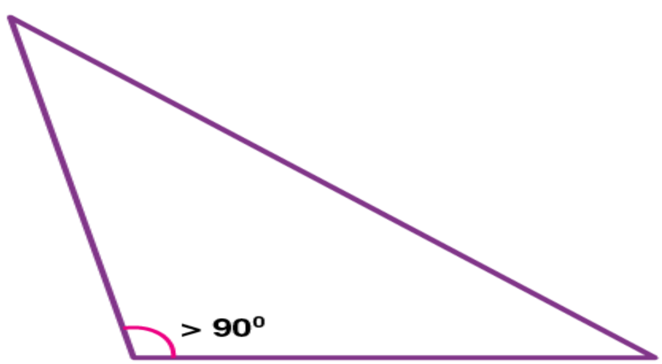
Right Angled Triangle

In a right triangle, one of the angles is equal to 90° or right angle.



Obtuse Angled Triangle

An obtuse triangle has any of its one angles more than 90°.



Perimeter of Triangle

A perimeter of a triangle is defined as the total length of the outer boundary of the triangle. Or we can say, the perimeter of the triangle is equal to the sum of all its three sides. The unit of the perimeter is same as the unit of sides of the triangle.

Perimeter = Sum of All Sides

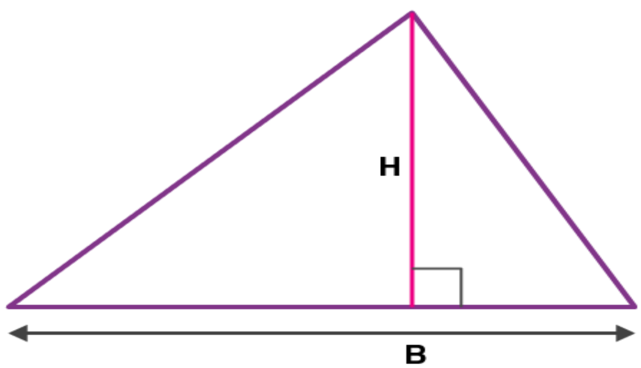
If ABC is a triangle, where AB, BC and AC are the lengths of its sides, then the perimeter of ABC is given by:

Perimeter = AB+BC+AC

Area of a Triangle

The area of a triangle is the region occupied by the triangle in 2d space. The area for different triangles varies from each other depending on their dimensions. We can calculate the area if we know the base length and the height of a triangle. It is measured in square units.

Suppose a triangle with base ‘B’ and height ‘H’ is given to us, then, the area of a triangle is given by-



Formula:

Area of triangle = Half of Product of Base and Height

Area = 1/2 × Base × Height

Example

Question- Find the area of a triangle having base equal to 9 cm and height equal to 6 cm.

Solution- We know that **Area = 1/2 × Base × Height**

= 1/2 × 9 × 6 cm^2

= 27 cm^2

Area of Triangle Using Heron's Formula

In case, if the height of a triangle is not given, we cannot be able to use the above formula to find the area of a triangle.

Therefore, Heron's formula is used to calculate the area of a triangle, if all the sides lengths are known.

First, we need to calculate the semi perimeter (s).

$s = (a+b+c)/2$, (where a,b,c are the three sides of a triangle)

Now Area is given by; $A = \sqrt{[s(s-a)(s-b)(s-c)]}$

Solved Examples

Question 1: If ABC is a triangle where AB = 3cm, BC=5cm and AC = 4cm, then find its perimeter.

Solution: Given, ABC is a triangle.

AB = 3cm

BC = 5cm

AC = 4cm

As we know by the formula,

Perimeter = Sum of all three sides

P = AB + BC + AC

P = 3+5+4

P = 12cm

Question 2: Find the area of a triangle having sides 5,6 and 7 units length.

Solution- Using Heron's formula to find the area of a triangle-

Semiperimeter (s) = (a+b+c)/2

s = (5 + 6 +7)/2

s = 9

Now Area of a triangle = $\sqrt{[s(s-a)(s-b)(s-c)]}$

$=\sqrt{[9(9-5)(9-6)(9-7)]}$

$=\sqrt{[9 \times 4 \times 3 \times 2]}$

$=\sqrt{[3 \times 3 \times 2 \times 2 \times 3 \times 2]}$

$=\sqrt{[3^2 \times 2^2 \times 3 \times 2]}$

$= 6\sqrt{6}$ square units..

Frequently Asked Questions – FAQs

What are triangles?

A triangle is a three-sided polygon, which has three vertices. The three sides are connected with each other end to end at a point, which forms the angles of the triangle. The sum of all three angles of the triangle is equal to 180 degrees.

How many types of triangles are there in Maths?

There are basically six types of triangles. They are:
Scalene Triangles
Isosceles triangles
Equilateral triangles
Acute triangles
Obtuse triangles
Right triangles

What are the properties of triangles?

Sum of angles of the triangle is equal to 180 degrees.
Exterior angles of a triangle add up to 360 degrees.
Shortest side is always opposite the smallest angle of a triangle.

What is the perimeter and area of a triangle?

The perimeter is the length of the outer boundary of the triangle and area is the region occupied by it in a two-dimensional space.

What is the formula for area and perimeter of a triangle?

The perimeter of triangle = Sum of all three sides
Area = ½ (Product of base and height of a triangle)

What is scalene, isosceles and equilateral triangle?

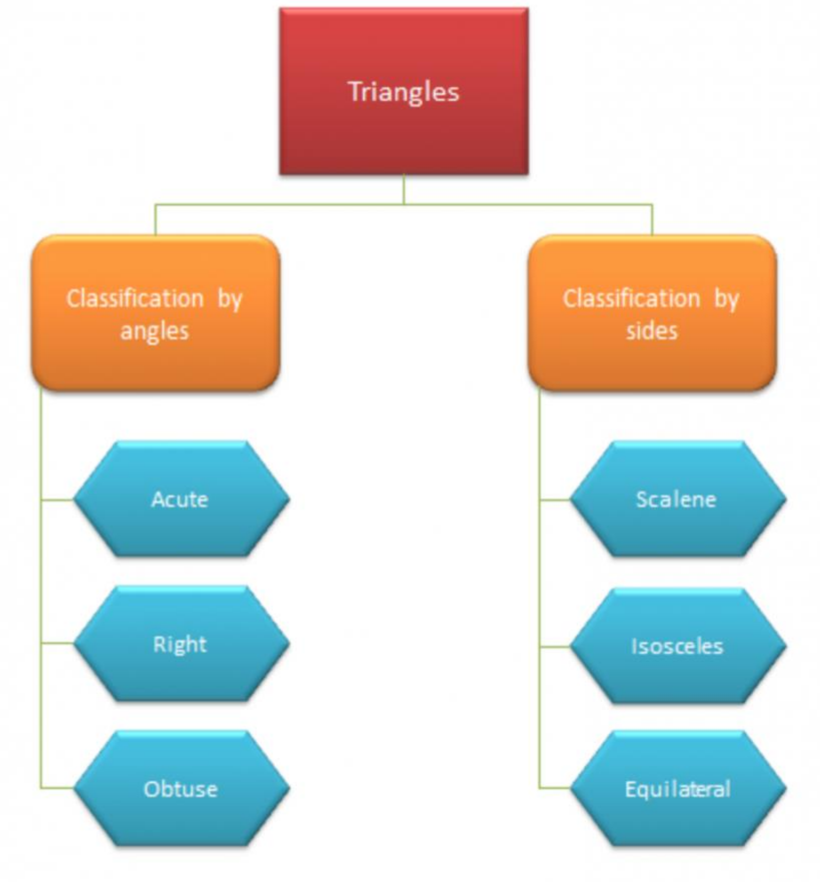
Scalene, isosceles and equilateral triangle are the types of triangles which differ from each other based on their side-length.
If all the three sides are different in length, then its scalene triangle.
If any two sides are equal in length, then it is an isosceles triangle.
If all three sides are equal in length, then it is an equilateral triangle.

What is the difference between acute triangle, obtuse triangle and right triangle?

An acute triangle has all its angles less than 90 degrees.
An obtuse triangle has any one of its angle greater than 90 degrees.
A right triangle has exactly one angle equal to 90 degrees.

Properties of Triangle: Summary & Key Takeaways

Let us summarize some of the important properties of a triangle.



- The sum of all interior angles of any triangle is equal to ***180^0***.
- The sum of all exterior angles of any triangle is equal to ***360^0***.
- An exterior angle of a triangle is equal to the sum of its two interior opposite angles.
- The sum of the lengths of *any* two sides of a triangle is always greater than the length of the third side.

- Similarly, the difference between the lengths of <u>any</u> two sides of a triangle is always less than the length of the third side.
- The side opposite to the smallest interior angle is the shortest side and vice versa.
- Similarly, the side opposite to the largest interior angle is the longest side and vice versa.
    - In the case of a right-angled triangle, this side is called the *hypotenuse*
- The height of a triangle is equal to the length of the perpendicular dropped from a vertex to its opposite side, and this side is considered the base.

Properties of Triangle: Application quizQuestion

Question: 1

In an isosceles triangle DEF, if an interior angle $\angle D = 100^0$ then what is the value of $\angle F$?

1. 20^0
2. 40^0
3. 60^0
4. 80^0
5. 100^0

Solution

Step 1: Given

- ΔDEF is an isosceles triangle
    - $\angle D = 100^0$

Step 2: To find

- The value of $\angle F$

Step 3: Approach and Working out

- We know that the sum of all interior angles in a triangle = 180^0
- Implies, $\angle D + \angle E + \angle F = 180^0$

- $\angle E + \angle F = 180^0 – 100^0 = 80^0$
- Since ΔDEF is an isosceles triangle; two of its angles must be equal.
- And the only possibility is $\angle E = \angle F$
- Therefore, $2\angle F = 80^0$
- Implies, $\angle F = 40^0$

Hence the correct answer is **Option B.**

Question 2

In a right-angled triangle, ΔABC, BC = 26 units and AB = 10 units. If BC is the longest side of the triangle, then what is the area of ΔABC?

1. 120
2. 130
3. 240
4. 260
5. 312

Solution

Step 1: Given

- ΔABC is a right-angled triangle
  - BC = 26 units
  - AB = 10 units
  - BC is the longest side of the triangle

Step 2: To find

- The area of triangle ∆ABC

Step 3: Approach and Working out

- We are given that BC is the longest side of the triangle, which implies that BC is the hypotenuse

Thus, according to Pythagoras rule:

- $BC^2 = AB^2 + AC^2$
- $26^2 = 10^2 + AC^2$
- $AC^2 = 676 – 100 = 576$
- Therefore, AC = 24 units
- We know that the area of a right-angled triangle = ½ * product of the two perpendicular sides = ½ * AB * AC = ½ * 10 * 24 = 120 sq. units

Hence the correct answer is **Option A**.

FAQ – Properties of a triangle

Question3: What is a triangle and its properties?

A triangle is a closed figure with three sides, three vertices, three angles, and the sum of internal angles is 180°

Question4: What are the different types of triangles?

Triangles can be classified in 2 ways, according to internal angles and according to length of the sides. According to internal angles, there are three types of triangles i.e., acute, right, and obtuse-angled triangle. According to length of sides, triangles can be classified into 3 categories i.e., Scalene, Isosceles, and Equilateral triangle.

Question6: What is a Scalene triangle?

A triangle that has all three sides of different lengths is a scalene triangle.

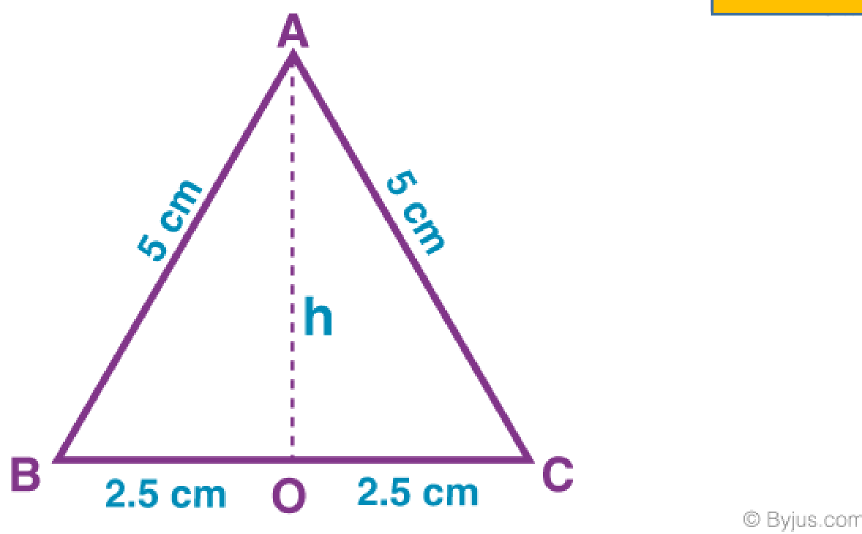
Question7: What is an Isosceles triangle?

A triangle that has two sides of the same length and the third side of a different length is an isosceles triangle.

Question 9: If an equilateral triangle has lengths of sides as 5 cm and perpendicular is drawn from the vertex to the base of the triangle, then find its area and perimeter.

Solution: Given, side of the equilateral triangle, say AB = BC = CD = 5 cm

If we draw a perpendicular from the vertex of an equilateral triangle, A to the base at point O, it divides the base into two equal sides.



Such that, BO = OC = 2.5 cm

Now, the area of triangle = ½ × Base × Height

To find the height of the triangle, AOB, we have to use Pythagoras theorem.

That is, $\text{Hypotenuse}^2 = \text{Base}^2 + \text{Perpendicular}^2$

Or Perpendicular = $\sqrt{\text{Hypotenuse}^2 - \text{Base}^2}$
Therefore, OA = $\sqrt{AB^2 - OB^2}$
Or OA = $\sqrt{5^2 - 2.5^2}$
OA = $\sqrt{25 - 6.25} = \sqrt{18.75}$
Area of triangle ABC = ½ × BC × OA

= ½ × 5 × $\sqrt{18.75}$ = 2.5 × 4.33
Area of triangle ABC = **10.825 cm^2**

Perimeter of triangle ABC = sum of all its three sides

= 5 + 5 + 5 cm

= **15 cm**

Question9:: If the sides of a triangle are given by 3 cm, 4 cm and 5 cm, where the base is 4cm and the altitude of the triangle is 3.2 cm, then find the area and perimeter of the triangle.

Solution: Let the given sides of the triangle be:

a = 3 cm, b = 4 cm and c = 5 cm

Altitude is the height of the triangle = 3.2 cm

By the formula of area of the triangle, we know;

Area = 1/2 x base x height

A = (1/2) x 4 x 3.2

A = 6.4 sq.cm.

Now, the perimeter of the triangle is given by;

P = a + b + c

P = 3 + 4 + 5

P = 12 cm.

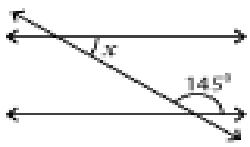
Assignments

Question 1

Interior Angles

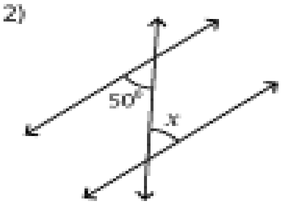
Find the value of x.

1)



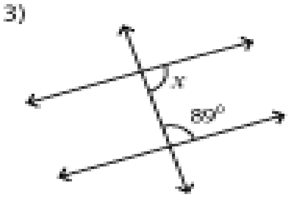
$x =$ ____________

2)



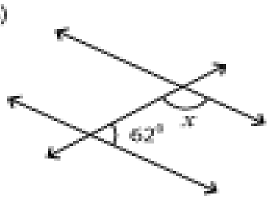
$x =$ ____________

3)



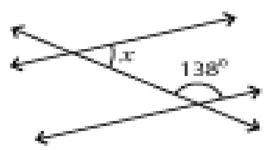
$x =$ ____________

4)



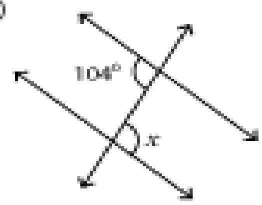
$x =$ ____________

5)



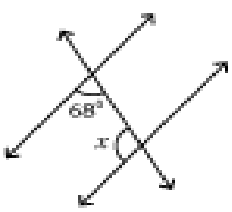
$x =$ ____________

6)



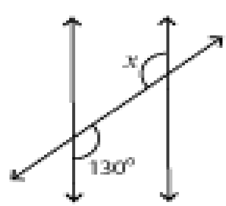
$x =$ ____________

7)



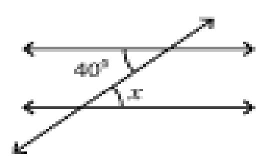
$x =$ ____________

8)



$x =$ ____________

9)



$x =$ ____________

Question2 : **Take three non-collinear points A, B and C on a page of your notebook. Join AB, BC and CA. What figure do you get? Name the triangle. Also, name**

(i) the side opposite to ∠ B

(ii) the angle opposite to side AB

(iii) the vertex opposite to side BC

(iv) the side opposite to vertex B.

Question 3: **Explain the following terms:**

(i) Triangle

(ii) Parts or elements of a triangle

(iii) Scalene triangle

(iv) Isosceles triangle

(v) Equilateral triangle

(vi) Acute triangle

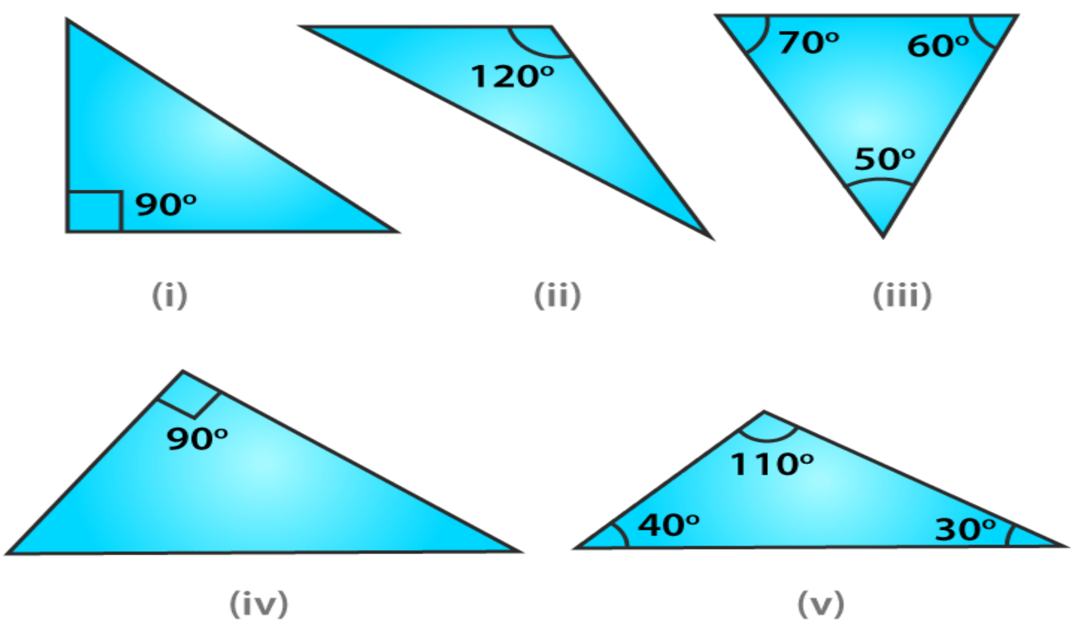
(vii) Right triangle

(viii) Obtuse triangle

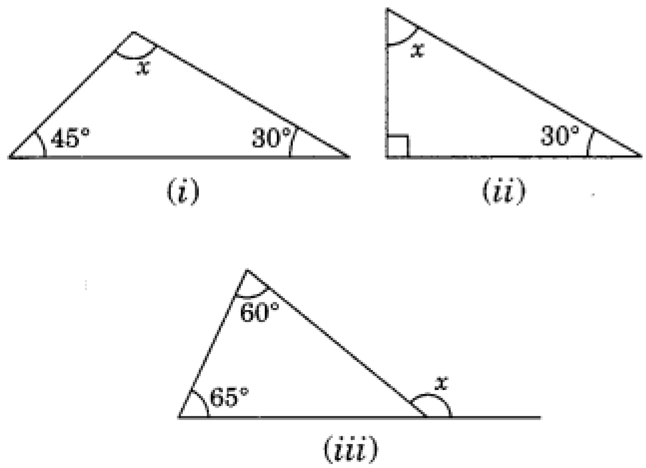
(ix) Interior of a triangle

(x) Exterior of a triangle.

Question 4: **In Fig. 12.14, there are five triangles. The measures of some of their angles have been indicated. State for each triangle whether it is acute, right or obtuse.**

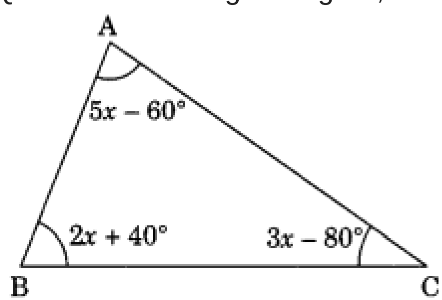


Question 5: In the given diagrams, find the value of x in each case.



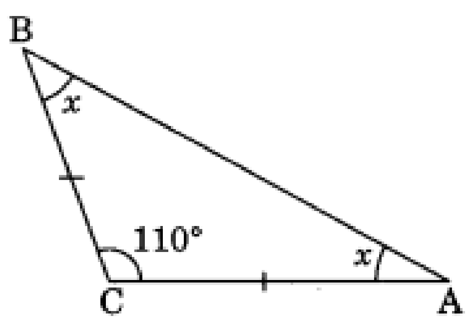
Question 6: Which of the following cannot be the sides of a triangle?
(i) 4.5 cm, 3.5 cm, 6.4 cm
(ii) 2.5 cm, 3.5 cm, 6.0 cm
(iii) 2.5 cm, 4.2 cm, 8 cm

Question 7 In the given figure, find x.



Question 8.One of the equal angles of an isosceles triangle is 50°. Find all the angles of this triangle.

Question 9.
In ΔABC, AC = BC and ∠C = 110°. Find ∠A and ∠B.



Mount Abu Public School
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Class – 6

Planner and Assignment

FROM: 22 FEBRUARY TO 28 FEBRUARY

TOPIC: PERIMETER AND AREA

SUBTOPIC:

- **PERIMETER**
- **AREA**

Number of blocks: 3

GUIDELINES: Refer to the content given below and view the links

- **The notes given below will help you to understand the concept and complete the assignment that follows**
- **The assignment is to be done in math note book**

Instructional Aids/Resource

Chapter will be explained through Powerpoint presentation and videos through Zoom classes,

Click on the links below to understand the concepts more

https://youtu.be/ThK7m4aZQGw

https://youtu.be/AIb5x7fmtvE

https://youtu.be/-J-6VGxld54

https://youtu.be/Z1OXa6hcLrc

https://youtu.be/nI0BM3e1iiE

LEARNING OBJECTIVES

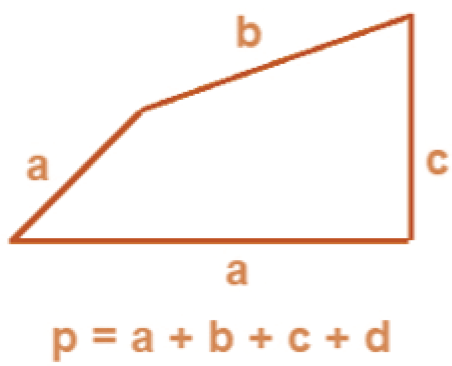
- **Observe and define perimeter and area**
- **Calculate area and perimeter**

DEVELOPMENT OF THE CHAPTER:

Perimeter

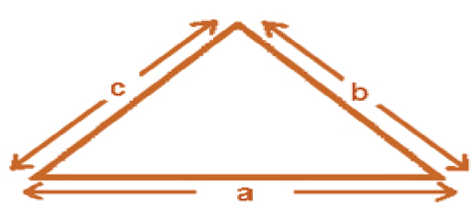
Perimeter

- Perimeter is the total length or total distance covered along the boundary of a closed shape.



- Perimeter of a circle is also called as the circumference of the circle.

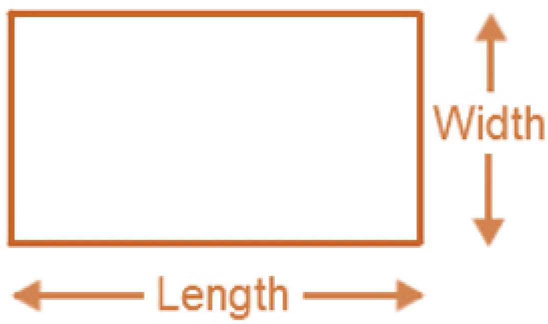
Perimeter of a Triangle



- Perimeter of triangle = Sum of lengths of all sides = a + b + c.

- If the given triangle is equilateral that is if all the sides are equal (a = b = c),
  then its perimeter is equal to 3 × length of one side of the triangle.

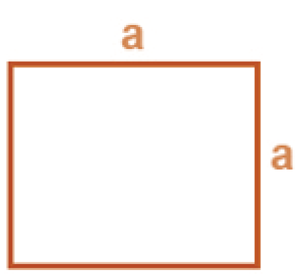
Perimeter of a Rectangle



- Perimeter of the rectangle = length (l) + length (l) + width (w) + width (w)

= 2× [length (l) + width (w)]

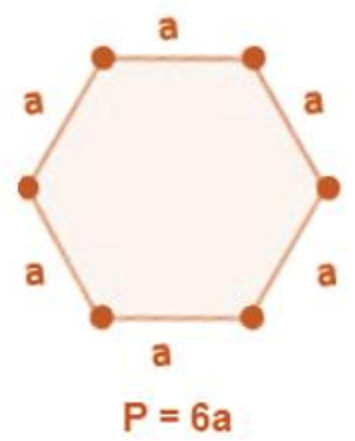
Perimeter of a Square



Perimeter of square = 4 × length of a side = 4a

Perimeter of a ‘n’ sided polygon

- A polygon is a closed shape made up of line segments.
- Perimeter of n sided polygon = n× length of one side.
- Example: Length of each side of a hexagon is a cm, then:
  Perimeter of the hexagon = 6a cm



Perimeter of irregular shapes

- Irregular shapes are the shapes which do not have all sides and angles equal.
- The perimeter of irregular shapes is equal to total length covered by the shape.
  In the figure given below, perimeter is the sum of all sides.

For more details https://youtu.be/3DCkOIdsAbE

Area

- Area is the total amount of surface enclosed by a closed figure.

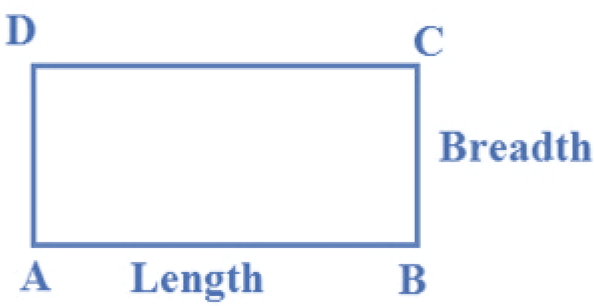
Area of Square

- Area of a square = Side × Side $= Side^2 = a^2$, where a is the

length of each side.

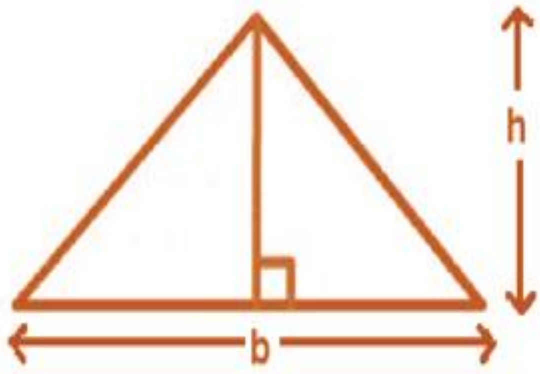
Area of Rectangle

- Area = length (l) × breadth (b)



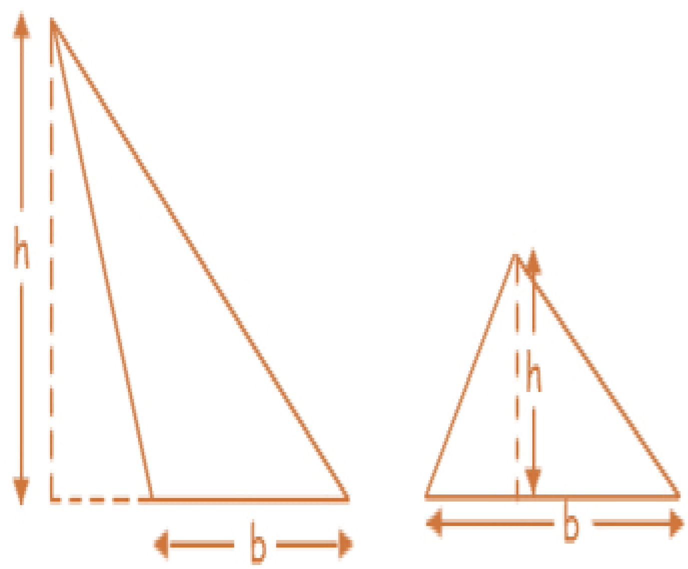
Area of a triangle

Area of triangle = (1/2) × base × height = (1/2) × b × h



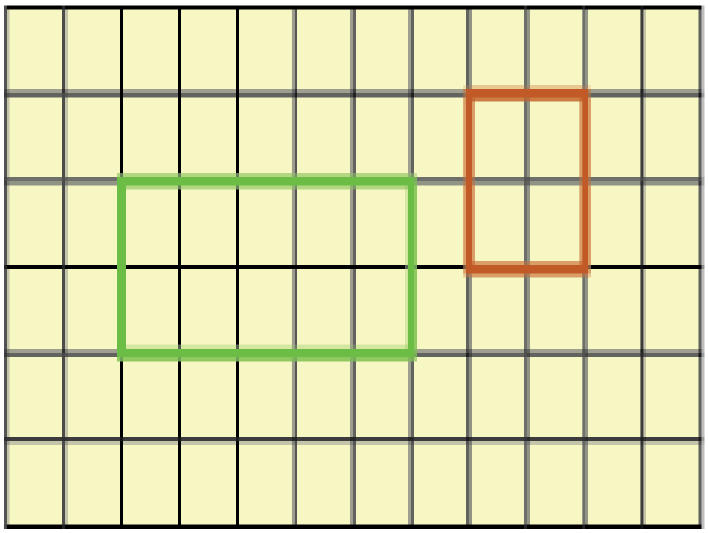
Areas of different types of triangles

- Consider an acute and an obtuse triangle.
  Area of each triangle = (1/2) × base × height = (1/2) × b × h



Visualisation of Area

- In the given graph, if the area of each small square is 1 cm^2, then
  Area of rectangle = l×b = 5×2 = $10cm^2$
  Area of square = a×a = 2×2 = $4cm^2$

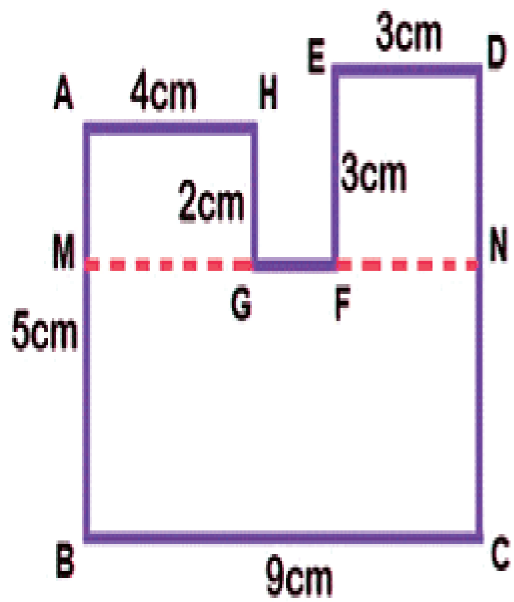


For more details click https://youtu.be/ztRPHaSQzcs

Area of irregular shapes

-
  - Area of an irregular figure can be calculated :
    Step 1: Divide the irregular shape into regular shapes that you can recognize (eg. triangles, rectangles, circles and squares)
    Step 2: Find the area of these individual shapes and add them. Sum will be the area of the irregular figure.
-
  - Example: Area of the given figure = Area of MNCB + Area of AMGH + Area of EFND
    = [5 × 9 + 4 × 2 + 3 × 3] cm^2

$= [45 + 8 + 9]\ cm^2$
$=62\ cm^2$



SOLVED EXAMPLES:

Question 1: Find the perimeter of a rectangle in which:
(i) length = 16.8 cm and breadth = 6.2 cm
(ii) length = 2 m 25 cm and breadth = 1 m 50 cm
(iii) length = 8 m 5 dm and breadth = 6 m 8 dm

ANSWER:

Perimeter of a rectangle = $2\times(\text{Length}+\text{Breadth})$2×(Length+Breadth)
(i) Length = 16.8 cm
Breadth = 6.2 cm
Perimeter = $2\times(\text{Length}+\text{Breadth})$2×(Length+Breadth)
= $2\times(16.8+6.2)=46$ cm2×(16.8+6.2) =46 cm
(ii) Length = 2 m 25 cm
=(200+25) cm (1 m = 100 cm)
= 225 cm
Breadth =1 m 50 cm
= (100+50) cm (1 m = 100 cm)
= 150 cm
Perimeter = $2\times(\text{Length}+\text{Breadth})$2×(Length+Breadth)
= $2\times(225+150)=750$ cm2×(225+150) =750 cm
(iii) Length = 8 m 5 dm
= (80+5) dm (1 m = 10 dm)
= 85 dm
Breadth = 6 m 8 dm
= (60+8) dm (1 m = 10 dm)
= 68 dm
Perimeter = $2\times(\text{Length}+\text{Breadth})$2×(Length+Breadth)
= $2\times(85+68)=306$ dm2×(85+68) =306 dm

Question 2: Find the cost of fencing a rectangular field 62 m long and 33 m wide at Rs 16 per metre.

ANSWER:

Length of the field = 62 m
Breadth of the field = 33 m
Perimeter of the field = 2(l + b) units
= 2(62 + 33) m =190 m
Cost of fencing per metre = Rs 16
Total cost of fencing = Rs (16××190) = Rs 3040

Question 3: The length and the breadth of a rectangular field are in the ratio 5 : 3. If its perimeter is 128 m, find the dimensions of the field.

ANSWER:

Let the length of the rectangle be 5*x* m.
Breadth of the rectangle = 3*x* m
Perimeter of the rectangle = 2(*l* + *b*)
= 2(5*x* + 3*x*) m
= (16*x*) m
It is given that the perimeter of the field is 128 m.

∴16x=128⇒x=12816=8∴Length =(5×8)=40mBreadth =(3×8)=24m∴16x=128⇒x=12816=8∴Length =(5×8)=40mBreadth =(3×8)=24m

Question 4: The cost of fencing a rectangular field at Rs 18 per metre is Rs 1980. If the width of the field is 23 m, find its length.

ANSWER:

Total cost of fencing = Rs 1980
Rate of fencing = Rs 18 per metre

Perimeter of the field
= Total costRate=Rs 1980Rs 18/m=(198018) m=110 mTotal costRate=Rs 1980Rs 18/m=(198018) m=110 m

Let the length of the field be *x* metre.
Perimeter of the field = 2(*x* + 23) m

∴2(x+23)=110⇒(x+23)=55x=(55−23)=32∴2(x+23)=110⇒(x+23)=55x=(55-23)=32
Hence, the length of the field is 32 m.

Question 5: The length and the breadth of a rectangular field are in the ratio 7 : 4. The cost of fencing the field at Rs 25 per metre is Rs 3300. Find the dimensions of the field.

ANSWER:

Total cost of fencing = Rs 3300
Rate of fencing = Rs 25/m

Perimeter of the field
= Total cost Rate of fencing=(Rs 3300Rs 25/m)=330025 m=132 mTotal cost Rate of fencing=(Rs 3300Rs 25/m)=330025 m=132 m

Let the length and the breadth of the rectangular field be 7*x* and 4*x*, respectively.
Perimeter of the field = 2(7*x* + 4*x*) = 22*x*

It is given that the perimeter of the field is 132 m.

∴ 22x=132⇒x=13222=6∴Length of the field =(7 × 6) m=42 mBreadth of the field =(4 × 6) m=24 m∴ 22x=132⇒x=13222=6∴Length of the field =(7 × 6) m=42 mBreadth of the field =(4 × 6) m=24 m

Question 6: Find the perimeter of a square, each of whose sides measures:
(i) 3.8 cm
(ii) 4.6 cm
(iii) 2 m 5 dm

ANSWER:

(i) Side of the square = 3.8 cm
Perimeter of the square = (4××side)
= (4××3.8) = 15.2 cm

(ii) Side of the square = 4.6 cm
Perimeter of the square = (4××side)
= (4××4.6) = 18.4 cm

(iii) Side of the square = 2 m 5 dm
= (20+5) dm (1 m = 10 dm)
= 25 dm
Perimeter of the square = (4××side)
= (4××25) = 100 dm

Question 7: The cost of putting a fence around a square field at Rs 35 per metre is Rs 4480. Find the length of each side of the field.

ANSWER:

Total cost of fencing = Rs 4480
Rate of fencing = Rs 35/m

Perimeter of the field
= Total costRate=Rs 4480Rs 35/m=448035 m=128 mTotal costRate=Rs 4480Rs 35/m=448035 m=128 m

Let the length of each side of the field be *x* metres.
Perimeter = (4*x*) metres
∴4x=128⇒x=1284=32 ∴4x=128⇒x=1284=32

Hence, the length of each side of the field is 32 m.
Question 8: Each side of a square field measures 21 m. Adjacent to this field, there is a rectangular field having its sides in the ratio 4 : 3. If the perimeters of both the fields are equal, find the dimensions of the rectangular field.

ANSWER:

Side of the square field = 21m
Perimeter of the square field = (4××21) m
= 84 m

Let the length and the breadth of the rectangular field be 4*x* and 3*x,* respectively.
Perimeter of the rectangular field = 2(4*x* + 3*x*) = 14*x*

Perimeter of the rectangular field = Perimeter of the square field

∴14x=84

⇒x=8414=6

∴14x=84 ⇒x=8414=6
∴ Length of the rectangular field =(4 × 6) m=24 m
Breadth of the rectangular field = (3 × 6) m=18 m

∴ Length of the rectangular field =(4 × 6) m=24 m

Breadth of the rectangular field = (3 × 6) m=18 m
Question 9: Find the perimeter of
(i) a triangle of sides 7.8 cm, 6.5 cm and 5.9 cm,
(ii) an equilateral triangle of side 9.4 cm,

(iii) an isosceles triangle with equal sides 8.5 cm each and third side 7 cm.

ANSWER:

(i) Sides of the triangle are 7.8 cm, 6.5 cm and 5.9 cm.
Perimeter of the triangle = (First side + Second side + Third Side) cm
= (7.8 + 6.5 + 5.9) cm
= 20.2 cm

(ii) In an equilateral triangle, all sides are equal.
Length of each side of the triangle = 9.4 cm
∴∴ Perimeter of the triangle = (3 ×× Side) cm
= (3 ×× 9.4) cm
= 28.2 cm

(iii) Length of two equal sides = 8.5 cm
Length of the third side = 7 cm
∴∴ Perimeter of the triangle = {(2 ×× Equal sides) + Third side} cm
= {(2 ×× 8.5) + 7} cm
= 24 cm

Question 10: Find the perimeter of
(i) a regular pentagon of side 8 cm,
(ii) a regular octagon of side 4.5 cm,
(iii) a regular decagon of side 3.6 cm,

ANSWER:

(i) Length of each side of the given pentagon = 8 cm
∴∴ Perimeter of the pentagon = (5××8) cm
= 40 cm

(ii) Length of each side of the given octagon = 4.5 cm
∴∴ Perimeter of the octagon = (8××4.5) cm
= 36 cm

(iii) Length of each side of the given decagon = 3.6 cm
∴∴ Perimeter of the decagon = (10××3.6) cm
= 36 cm

SUMMERY:

Main points

- The sum of all sides of a closed plane figure is called its perimeter.
- Perimeter of a square = 4 x side
- Perimeter of a rectangle = 2 x [length + breadth]
- The measurement of the region enclosed by a plane figure is called the area of the figure.
- Area of the rectangle = length x breadth
- Length of a rectangle = $\frac{area}{breadth}$
- Breadth of a rectangle = $\frac{area}{length}$
- Area of square = side x side
- The standard unit of perimeter is that of length
- Standard unit of area is 1 sq m or 1 sq cm or 1 sq mm.

ASSIGNMENT

1. Find the perimeters of the rectangles whose lengths and breadths are given below:

(i) 7 cm, 5 cm

(ii) 5 cm, 4 cm

(iii) 7.5 cm, 4.5 cm

2. Find the perimeters of the squares whose sides are given below:

(i) 10 cm

(ii) 5 m

(iii) 115.5 cm

3. Find the side of the square whose perimeter is:

(i) 16 m

(ii) 40 cm

(iii) 22 cm

4. Find the breadth of the rectangle whose perimeter is 360 cm and whose length is

(i) 116 cm

(ii) 140 cm

(iii) 102 cm

5. A rectangular piece of lawn is 55 m wide and 98 m long. Find the length of the fence around it.

6. The side of a square field is 65 m. What is the length of the fence required all around it?

7. Two sides of a triangle are 15 cm and 20 cm. The perimeter of the triangle is 50 cm. What is the third side?

8. A wire of length 20 m is to be folded in the form of a rectangle. How many rectangles can be formed by folding the wire if the sides are positive integers in metres?

9. A square piece of land has each side equal to 100 m. If 3 layers of metal wire has to be used to fence it, what is the length of the wire needed?

10. Shikha runs around a square of side 75 m. Priya runs around a rectangle with length 60 m and breadth 45 m. Who covers the smaller distance?

11. The dimensions of a photographs are 30 cm × 20 cm. What length of wooden frame is needed to frame the picture?

12. The length of a rectangular field is 100 m. If the perimeter is 300 m, what is its breadth?

13. To fix fence wires in a garden, 70 m long and 50 m wide, Arvind bought metal pipes for posts. He fixed a post every 5 metres apart. Each post was 2 m long. What is the total length of the pipes he bought for the posts?

14. Find the cost of fencing a rectangular park of length 175 m and breadth 125 m at the rate of Rs 12 per meter.

15. The perimeter of a regular pentagon is 100 cm. How long is each side?

16. Find the perimeter of a regular hexagon with each side measuring 8 m.

17. A rectangular piece of land measure 0.7 km by 0.5 km. Each side is to be fenced with four rows of wires. What length of the wire is needed?

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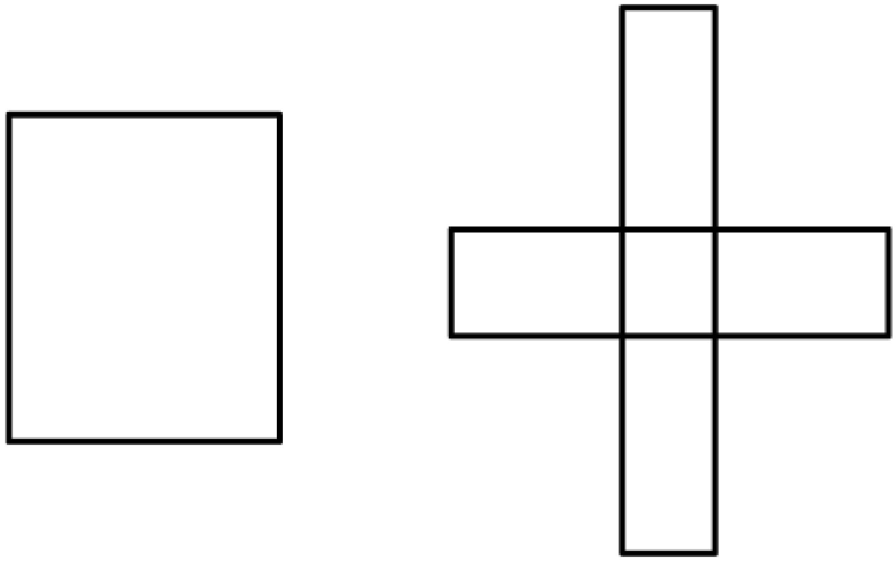
18. Avneet buys 9 square paving slabs, each with a side of ½ m. He lays them in the form of a square.

(i) What is the perimeter of his arrangement?

(ii) Shari does not like his arrangement. She gets him to lay them out like a cross. What is the perimeter of her arrangement?

(iii) Which has greater perimeter?

(iv) Avneet wonders, if there is a way of getting an even greater perimeter. Can you find a way of doing this? (The paving slabs must meet along complete edges they cannot be broken)



1. The following figures are drawn on a squared paper. Count the number of squares eclosed by each figure and find its area, taking the area of each square as 1 cm^2. (Fig. 20.25).